EXHIBIT 2
PUBLIC REDACTED VERSION

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

IN RE GOOGLE PLAY STORE ANTITRUST LITIGATION	Case No. 3:21-md-02981-JD
	Case No. 3:21-cv-05227
THIS DOCUMENT RELATES TO:	
In re Google Play Consumer Antitrust Litigation, Case No. 3:20-cv-05761-JD	
State of Utah et al. v. Google LLC et al., Case No. 3:21-cv-05227-JD	
Match Group, LLC et al. v. Google LLC et al., Case No. 3:22-cv-02746-JD	

EXPERT REPORT OF DR. GREGORY K. LEONARD

November 18, 2022

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I.   QUALIFICATIONS

1.   My name is Gregory K. Leonard. I am an economist and Vice President at Charles River Associates, 601 12th Street, Suite 1500, Oakland, CA 94607.

2.   I received a Bachelor of Science in Applied Mathematics-Economics from Brown University in 1985 and a Ph.D. in Economics from the Massachusetts Institute of Technology in 1989. After receiving my Ph.D., I became an assistant professor at Columbia University. I subsequently moved into economic consulting and worked at several economic consulting firms prior to joining CRA.

3.   My specialties within economics are applied microeconomics, the study of the behavior of consumers and firms, and econometrics, the application of statistical methods to economics data. I have published more than sixty articles in scholarly and professional publications, which are listed on my curriculum vitae, which is attached as Appendix A. Many of these articles address issues in industrial organization, antitrust, and econometrics.

4.   I am the Vice Chair for Economics of the Board of Editors of the *Antitrust Law Journal* and have served as a referee for numerous economics and other professional journals. I have given invited lectures on antitrust issues at the Federal Trade Commission (FTC), the United States Department of Justice (DOJ), the Directorate General for Competition of the European Commission, the Fair Trade Commission of Japan, and China's Supreme People's Court and Ministry of Commerce. I have been retained by the DOJ to consult on antitrust matters.

5.   In 2007, I served as a consultant to, and testified before, the Antitrust Modernization Commission, which was tasked by Congress and the President of the United States to make recommendations for revising U.S. antitrust laws.

6.   I have substantial experience in the smartphone and software industries, having served as an economics expert in litigation matters involving Google, Samsung, SAP, Box, and Qualtrics, among others.

7.   I have served as an expert witness in a number of litigation matters before U.S. District Courts, state courts, arbitration panels, and the U.S. International Trade Commission. A list of cases in which I have testified (in deposition or at trial) in the last five years is provided in Appendix A. My hourly rate for this matter is $1,200. My or CRA's compensation is not contingent on the outcome of the case.

II.   ASSIGNMENT

8.   I have been asked by counsel for Google to review and respond to the damages analyses contained in the expert reports of Dr. Hal Singer (consumer class), Dr. Mark Rysman (States), Mr. Saul Solomon (States), and Dr. Steven Schwarz (Match) (respectively, "the Singer Report," "the Singer Class Report," "the Singer Class Rebuttal Report," "the Rysman Report," "the Solomon Report," and "the Schwartz Report").

9.   For the purposes of the damages analysis, I assume liability, although I understand that Google contests plaintiffs' antitrust liability allegations. The information I have considered in forming my opinions for this report is noted throughout the report and includes the materials listed in Appendix B. I reserve the right to supplement my report, for example, if additional information becomes available.

III. SUMMARY OF OPINIONS

10.   I have reached the following opinions:

Plaintiffs' Experts Fail to Describe the But-For World

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a. Compensatory damages is the difference between the financial position the plaintiff would have been in a world "but for" the alleged unlawful conduct and the plaintiff's financial position in the actual world. When calculating compensatory damages, the "construction" of the but-for world is a critical step. If the but-for world is incorrectly specified, the damage calculation based on comparing the actual world to the but-for world will be fundamentally flawed.

b. Plaintiffs' experts offer damages models without defining, with clarity, the but-for world that would have existed absent the alleged Google conduct. For example, Dr. Rysman offers a damages model based on the assertion that developers would have introduced more Android apps in the but-for world if Google charged a lower service fee. Yet, he does not identify a single developer that decided against launching an app due to the level of Google's service fee in the actual world, or identify a single app that would have been introduced had Google's service fee been lower. Dr. Singer offers a damages model where a crucial input is the share of competing app stores in the but-for world, yet he does not identify any of the stores, what their entry or pricing strategies would have been, or how long it would have taken for them to achieve the market share that Dr. Singer assumes they would have. The failure to adequately define the but-for world makes Plaintiffs' experts' damages models fundamentally flawed.

c. While Plaintiffs' experts offer a number of different models and approaches to estimating damages, their failure to define adequately and clearly the but-for world results in damages models that are inconsistent with one another in important respects. For example, Dr. Schwartz (Match's expert) assumes zero pass-through of service fees, while Dr. Singer (Consumer Plaintiffs' expert) assumes a 91.1% pass-through rate, including a 81.4% pass-through rate for dating apps, and Dr. Rysman (the States' expert) assumes 100% pass-through for all apps. Another example is that Dr. Singer offers a damages model based on the proposition that Google would greatly increase its consumer subsidy to users, while Dr. Rysman's consumer subsidy damages model assumes Google would have the same subsidy but introduce it earlier. This lack of consistency among the various damages models reflects that Plaintiffs' experts have not grounded their damages models in a well-specified construction of the but-for world.

Dr. Singer's and Dr. Rysman's Pass-Through Models Are Flawed

d. Dr. Singer uses a theoretical model to support his opinion that lower service fees in the but-for world would have been passed through to consumers by app developers at a rate of 91.1%. Dr. Rysman assumes 100% pass-through. Both experts base their pass-through rates on unsupported assumptions regarding the demand for paid downloads, in-app purchases, and subscriptions. Moreover, Dr. Singer ignores that service fees are assessed on an *ad valorem* basis and both experts ignore that developers' focal-point pricing can result in even lower or non-existent pass-through rates. Thus, the pass-through rate is an

empirical question that must be directly analyzed. Neither Dr. Singer nor Dr. Rysman performed a valid empirical analysis of pass-through.

e. I have conducted an empirical analysis of pass-through of Google Play service fees based on actual changes in the service fees that have occurred and how app prices changed in response and find that a conservative estimate of the aggregate pass-through rate is 3%, much lower than Dr. Singer and Dr. Rysman assume. Correcting their error substantially reduces their consumer damages in their models.

Dr. Singer's Calculations of Damages to Consumers in the Putative Class are Flawed

f. Dr. Singer calculates consumer damages based on an overcharge theory using a theoretical model. In addition to substantially overstating the pass-through rate, Dr. Singer uses other badly flawed inputs to his model. For example, he overstates Google Play's share in the actual world. His estimate of Google Play's share in the but-for world is based on an unsupoort and inappropriate benchmark—AT&T's share of long-distance wireline telephone service in the early 1980s. As a result of Dr. Singer's flawed assumptions, he substantially overstates the overcharge damages.

g. Dr. Singer also calculates consumer damages based on the theory that Google would have provided more subsidies in the but-for world. Because he uses the same flawed theoretical model as he uses for his overcharge damages model, his consumer subsidy damages are also substantially overstated.[1]

h. Finally, Dr. Singer calculates consumer subsidy damages using Amazon Coins as a benchmark for Google's loyalty program, Google Play Points. However, Amazon Coins operates in a fundamentally different way than Google Play Points, and Dr. Singer ignores other differences between Google Play and the Amazon App Store that make Amazon Coins an inappropriate benchmark for calculating damages in this case.

Dr. Rysman's Calculations of Damages to Consumers in the Plaintiff States Are Flawed

i. Dr. Rysman calculates consumer overcharge damages by assuming that the but-for service fee rate would have been 15% and would have been passed-through to consumers at a rate of 100%. As noted above, 100% pass-through is inconsistent with the empirical evidence. Dr. Rysman bases his 15% but-for service fee rate on a set of benchmarks. However, the benchmarks he cites have service fees that range as high as 30%. He provides no reasonable explanation for why the but-for commission rate is not 25% or even 30% given

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[1] Dr. Singer also calculates "hybrid" damages based on a combination of overcharges in service fees and reduced consumer subsidies. These "hybrid" calculations are flawed for the same reasons as the individual calculations.

his own benchmarks charge rates at this level. As a result, Dr. Rysman's overcharges damages calculation is substantially overstated.

j.   Dr. Rysman also calculates what he calls consumer "variety" damages on the theory that if Google charged a lower service fee, developers would have introduced more apps in the but-for world, and consumers were harmed by less app "variety." These calculations are flawed for numerous reasons.

- Dr. Rysman's variety damages are calculated based on a highly abstract theoretical model that is completely divorced from the realities of the marketplace.[2] For example, Dr. Rysman's model assumes that all apps are the same in terms of their quality, demand, marginal cost, and cost of entry. As a consequence, in Dr. Rysman's model, all apps have the same price, quantity sales, and profitability. In reality, apps vary widely in their prices, quality, costs, and quantity sales. Dr. Rysman's assumption leads his model to substantially overstate "variety" damages. Because Dr. Rysman's model assumes all apps are the same, it assumes that, in particular, the apps that did not enter in the actual world, but would have entered in the but-for world, are of the same quality as the apps that were present in the actual world. However, basic economics suggests that the apps developers did not introduce in the actual world were of lower quality or higher cost than apps that were present in the actual world. Thus, even if these low quality/high cost apps would have been available in the but-for world (which is not the case for several reasons), they would have generated substantially less value for consumers than Dr. Rysman's model assumes.

- Dr. Rysman's model makes further simplifying assumptions, such that consumers have perfect information about all apps in the Google Play store and that apps do not exhibit direct network effects. I demonstrate that relaxing these assumptions in Dr. Rysman's model would decrease his damages calculation. For example, if apps have direct network effects (as would be expected in dating apps and certain games, for example), an increased number of apps in the but-for world would have decreased the direct network effects for existing apps, which would have harmed consumers who use those apps. This is an offset to Dr. Rysman's variety damages, and accordingly his variety damages must be reduced by this harm to consumers.

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[2]   Dr. Rysman also calculates "hybrid" damages based on combinations of overcharges in service fees, reduced consumer subsidies, and foregone variety. These hybrid calculations are flawed for the same reasons discussed for each individual calculation.

- Dr. Rysman's "variety" damages model is based on the theory that an increase in costs to developers will result in fewer apps being introduced and a loss in consumer welfare. However, Dr. Rysman fails to account for increased costs to developers in the but-for world, such as the increased costs to distribute apps through multiple app stores or forked Android devices. Thus, this model is flawed because it fails to account for the decrease in consumer welfare brought about by the increase in costs to developers.

Mr. Solomon's Disgorgement and Restitution Calculations Are Flawed

k. Mr. Solomon bases his disgorgement and restitution calculations on Dr. Singer's and Dr. Rysman's damages models. Because those models are flawed, Mr. Solomon's disgorgement and restitution calculations are flawed as well.

l. Additionally, Mr. Solomon's disgorgement calculation suffers from a conceptual error. From an economics standpoint, a group should be entitled only to a portion of the "ill-gotten profits" that reflects the relative antitrust harm it sustained compared to other groups. Otherwise, there would necessarily be multiple recovery of the same "ill-gotten profits." Mr. Solomon has not performed the necessary apportionment to consumers, his disgorgement calculation is substantially overstated as a remedy for consumers.

Dr. Schwartz's Calculations of Match's Damages Are Flawed

m. Dr. Schwartz calculates damages for the Match Plaintiffs under the assumption that Google would have changed its pricing strategy in the but-for world by breaking the Google Play service fee into (1) a fee for Google Play's billing system and (2) a fee for other Play store services equal to the value of such services to a given app. However, Dr. Schwartz's damages model and calculations are flawed for numerous reasons.

n. First, Dr. Schwartz's model makes unsupported assumptions about Google's fee structure in the but-for world, including that (1) Google would only charge a small fee, akin to a payment processing fee, for in-app purchases (IAPs) processed through Google Play's billing system and charge separately for Play's value for app discovery and delivery; (2) Google would not charge for any other value that Play provides developers; and (3) Google would charge nothing for IAPs processed through an alternative billing system. Moreover, Dr. Schwartz does not explain how his claimed but-for fee structure would work for other app developers, for whom the value of other Play services is greater than the service fee in the actual world.

o. Second, Dr. Schwartz bases his estimate of the amount Match would pay for app discovery and delivery based on an internal Google analysis of the potential value of those services, which he says would inform the starting point for negotiations between Google and Match

regarding the fee for those services. However, the analysis Dr. Schwartz relies upon was ██ ███ Moreover, Dr. Schwartz cherry-picked only one of the iterations—the one that yielded the lowest value of Play to the Match Plaintiffs—and used it to represent the end point of what Google and Match would have negotiated regarding the service fee in the but-for world. Dr. Schwartz also gives no explanation why the other iterations would not have also informed the parties' bargaining positions in the but-for world. Had Dr. Schwartz used any of the other iterations, his calculated damages would have been much lower than he estimated, or even negative, meaning that Match would have paid Google more in the but-for world than it paid in the actual world.

p. Third, even accepting Dr. Schwartz's damages model, he ignores that Match would have still owed fees for app discovery and delivery for Match apps that did not use Google Play's billing system. Accounting for the fees on these transactions would result in a substantial offset to Dr. Schwartz's calculated damages.

Damages Calculations Based on Alternative Assumptions

q. I have performed a consumer damages calculation based on the assumption that, in the but-for world, Google would have alternatively offered its current (2022) service fee rate structure starting from the beginning of the damages period but would have left its consumer subsidy rate at its actual levels. I calculate consumer damages to be up to ████ ██████

r. I have separately performed a consumer damages calculation based on the assumption that, in the but-for world, Google would have offered its consumer subsidy rate after the Play Points program was launched in the U.S. in November 2019 at an earlier point in time but would have left its service fee rate at its actual levels. I calculate consumer damages based on Play Points to be up to █████████ n and consumer damages based on non-Play Points discounts to be up to ████████.

s. I have also used these alternative damages models to calculate an alternative measure of restitution. As I noted above, with respect to disgorgement, from an economics standpoint, consumers should only be entitled to a portion of the "ill-gotten gains" that reflect the antitrust harm they suffered. However, for completeness, I have calculated an alternative measure of disgorgement based on my alternative damages models without any apportionment.

t. I have calculated Match Plaintiffs' damages under the assumption that the 2022 Google Play service fees would have been in effect from the beginning of the Match Plaintiffs' damages period. Applying these service fees to Match Plaintiffs' transactions processed through Google Play's billing system results in Match paying in the actual world an additional ███████████ in service fees for the period from 7/7/2017 – 12/31/2021 and

██████████ for the period from 5/9/2018 – 12/31/2021 than they would have paid in the but-for world. However, I also find that Google would have charged a service fee for Match Plaintiffs' transactions that were not processed through Google Play's billing system and Match would have to pay these service fees to Google in the but-for world. Accounting for the but-for fees owed to Google for the Match Plaintiff's revenues processed using third-party billing services, damages for both periods are negative (i.e., Match Plaintiffs' would owe more to Google than the alleged excess services fees it paid to Google). Thus, Match Plaintiffs are not entitled to any damages.

IV.   OVERVIEW OF PLAINTIFFS' EXPERTS' APPROACHES

11.   The various Plaintiffs' experts have, collectively, offered a wide variety of calculations (damages, disgorgement, and restitution) using a wide variety of approaches and inputs. As I discuss in detail below, their assumptions and approaches often contradict each other. In this section, I summarize each calculation.

A.   Consumers and States

12.   Both Dr. Singer and Dr. Rysman perform calculations of what they assert are damages to consumers as a result of the alleged Google conduct. In addition, Dr. Solomon performs calculations of disgorgement of Google's profits due to the alleged conduct and restitution to consumers for the effects of the alleged conduct.

1. "Overcharge" Damages to Consumers

13.   The first approach to consumer damages, taken by both Dr. Singer and Dr. Rysman, is to calculate the alleged "overcharges" paid by consumers on paid app downloads, IAPs, and subscriptions obtained via the Google Play store. These alleged overcharges arose, according to Drs. Singer and Rysman, because Google would have charged app developers a lower service fee rate absent the alleged Google conduct and app developers would have lowered their download, IAP, and subscription prices to consumers in response to the lower service fee rate. The two key inputs to Dr. Singer's and Dr. Rysman's overcharge damages calculations are therefore (1) the

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service fee rate that Google would have charged in the "but-for world" and (2) the extent to which app developers would have passed the service fee rate savings through to consumers.

14.   As discussed in detail below, Dr. Singer's and Dr. Rysman's calculations are flawed because both their assumed pass-through rates are too high, as demonstrated in particular by empirical evidence, and their assumed but-for Google Play service fee rates are too low, again as demonstrated by empirical evidence.

2. "Consumer Subsidy" Damages to Consumers

15.   The second approach to consumer damages taken by both Dr. Singer and Dr. Rysman is to calculate the extent to which "consumer subsidies" provided by Google to consumers were lower than they allegedly would have been absent the alleged Google conduct. The consumer subsidies in question include Google Play Points ("Play Points"), which consumers earn from purchases in the Google Play store and can redeem to make future purchases, and other discounts that Google provides to consumers. According to Drs. Singer and Rysman, in the but-for world, Google would have been forced by greater competition to provide greater amounts of Play Points to consumers, but they offer inconsistent models of how Google would provide more Play Points in the but-for world. Dr. Rysman asserts that Google would have started offering the Google Play Points program earlier in the but-for world than it did in the actual world, but that the program would otherwise have been the same; he assumes that the non-Play Points discounts would have remained the same as in the actual world. Dr. Singer asserts that Google would have started offering the Play Points program earlier in the but-for world than it did in the actual world and that Google would have increased the subsidy amount provided through Play Points and other discounts. The key input to the consumer subsidy damages calculations is the amount by which Google Play

Points would have been greater in the but-for world than the actual world at each point in time during the alleged damages period.

16.   As discussed in detail below, Dr. Singer's consumer subsidy damages calculations are flawed because the calculations suffer from all the flaws of Dr. Singer's two-sided platform pricing model as discussed in Section VI. B.

3.   "Variety" Damages to Consumers

17.   Dr. Rysman (but not Dr. Singer) provides a consumer damages calculation based on the assertion that there would have been a large number of additional Android apps in the but-for world and this additional "variety" of apps would have created substantial additional value for consumers. Dr. Rysman relies on a highly stylized economic model of supply and demand for apps to both predict the number of additional apps that allegedly would have existed in the but-for world and the value that consumers allegedly would have placed on these additional apps.

18.   As discussed in detail below, Dr. Rysman's variety damages calculation is flawed and highly speculative because the theoretical model on which it is based makes numerous assumptions that both are inconsistent with the real world and lead to an overstatement of the damages calculated using the model.

4.   "Hybrid" Damages to Consumers

19.   Both Dr. Singer and Dr. Rysman perform "hybrid" calculations that combine one or more of the overcharge, consumer subsidy, and variety calculations described above. Specifically, Dr. Singer performs a hybrid overcharge and consumer subsidy calculation and Dr. Rysman performs a hybrid overcharge and variety calculation. These hybrid calculations are flawed for the same reasons that each of the component calculations is flawed.

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5.   Disgorgement of Google Profits

20.   The States' expert Mr. Solomon performs a "disgorgement" calculation in which he claims to identify the amount of additional profit Google made as a result of the alleged conduct. He calculates separate disgorgement amounts based on Dr. Singer's and Dr. Rysman's multitude of models, as discussed in Section X. A. Specifically, Mr. Solomon projects what Google's revenues and costs allegedly would have been in the but-for world and compares those to Google's actual revenues and costs. The key inputs to his calculations are (1) the Google Play market share in the actual and but-for worlds, (2) the Google Play service fee rate in the but-for world, (3) the Google Play consumer subsidy rate in the but-for world, and (3) the elasticity of demand for paid apps, IAPs and subscriptions.

21.   As discussed in detail below, Mr. Solomon's calculation is flawed because the figures he uses for the but-for Google Play market share and commission rate—inputs Mr. Solomon received from other Plaintiffs' experts—are understated, while the inputs he uses for the actual Google Play market share and but-for Google consumer subsidy are overstated.

6.   Restitution to Consumers

22.   Mr. Solomon also performs "restitution" calculations in which he claims to identify the additional amount of money consumers would have possessed but for the alleged Google conduct. He calculates the additional amount of revenue Google received in the actual world as compared to what it would have received in the but-for world and then multiplies by the pass-through rate. The result is Mr. Solomon's first restitution calculation (the revenue-based restitution). It is similar in nature to Dr. Singer's and Dr. Rysman's overcharge damages calculations. Mr. Solomon goes on to adjust the first restitution calculation downward by the extent to which Google's costs allegedly were higher in the actual world than they would have been in the but-for world. The result is Mr. Solomon's second restitution calculation (the profit-based restitution). This version

of the restitution calculation is similar in nature to the disgorgement calculation, except that it only considers the percentage change in Google's revenue per transaction (i.e., the price effects) and adjusts the disgorgement for the rate at which app developers pass-through the service fee rate to consumers, in an attempt to limit the calculation to consumers. The key inputs to these restitution calculations are (1) the but-for Google Play service fee rate, (2) the but-for Google consumer subsidy rate, (3) the actual and but-for Google Play market shares, and (4) the pass-through rate.

23.   As discussed in more detail below, Mr. Solomon's restitution calculations are flawed because the values he uses for the key inputs (which he received from other Plaintiffs' experts) are either overstated (in the case of the actual Google Play market share, the but-for Google consumer subsidy rate, and the pass-through rate) or understated (in the case of the but-for Google Play service fee rate and market share).

B.   Match Plaintiffs

24.   Dr. Schwartz performs a calculation of what he claims are the damages to the Match Plaintiffs as a result of Google's alleged conduct. He takes the difference between the service fees Match Plaintiffs paid to Google and what he says the services provided by Google Play and Google Play's billing system were worth to the Match Plaintiffs. The key inputs to this calculation are the value that the Match Plaintiffs received from Google Play and the alleged "market price" for Google Play's billing system, which Dr. Schwartz compares to payment processors. Dr. Schwartz's model assumes that this lower service fee would not have been passed through to consumers in the form of lower prices, in direct conflict with the overcharges and hybrid damages models offered by Dr. Singer and Dr. Rysman. Moreover, the implication of Dr. Schwartz's model is that Google would have changed its monetization strategy in a way that would have resulted in

Google charging some developers more fees than they currently pay, which also conflicts with the underlying damages models proposed by Dr. Singer and Dr. Rysman.

25.   As discussed in detail below, the Match Plaintiffs' damages calculation is flawed and unsupported because it (1) is based on the assumption that Google could not have continued to charge for Google Play's value as a percentage of consumer spend on IAP even when an alternative billing option is used; (2) assumes that Google would have changed its monetization strategy from one where it charges a service fee on IAPs to one where it charged separate fees for payment processing and other services provided by Google Play, and (3) substantially understates the value the Match Plaintiffs received from Google Play. In addition, unlike Drs. Singer and Rysman who assert that developers passed through all or nearly all the alleged service fee overcharge to consumers, Dr. Schwartz implicitly assumed that Match Plaintiffs would not have passed through any of their but-for service fee savings to consumers.

V.   BACKGROUND

A.   Compensatory Damages and Construction of the But-For World

26.   To an economist, compensatory damages should return a plaintiff to the financial position it would have been in absent the unlawful conduct. Accordingly, an economist defines compensatory damages as the difference between the financial position the plaintiff would have been in the "counterfactual world" that would have existed "but for" the alleged unlawful conduct and the plaintiff's financial position in the actual world. I understand that this definition accords with the legal definition.

27.   The "construction" of the but-for world is a crucial step in a compensatory damages calculation. If the but-for world is incorrectly specified, the damage calculation based on comparing the actual world to the but-for world will be fundamentally flawed and will not properly

return the plaintiff to the financial position it would have been in absent the alleged misconduct. Specifying the but-for world is a complex undertaking in a case such as this one because the various relevant economic actors—including the defendant, the plaintiffs, and third parties— would be expected to respond to the absence of the alleged unlawful conduct in the but-for world by changing their behavior from what they did in the actual world. These changes in behavior in the but-for world can affect the damages calculation. As a simple example, suppose a defendant is alleged to have monopolized a market by imposing a particular restriction on its customers. In the absence of that restriction (the complained-of conduct), the extent of the customers' damages typically would depend on what third parties would have entered the market, when they would have entered, and what product(s) they would have offered in the but-for world. A failure to analyze and specify these important aspects of the but-for world would result in an unsound damages calculation.

28.   In this case, the important aspects of the but-for world that are relevant for Plaintiffs' experts damages calculations, but that they either did not address at all or did not address clearly, include (1) what app stores or types of app stores would have entered, when would they have entered, what devices would they be on, and which apps would have been available in those stores; (2) how Google would have changed its level of investment in Android, Google Play and app developer support; (3) if, how, and why Google would have changed its monetization strategy; (4) how consumers would have been affected by the existence of additional app stores (e.g., greater search costs or increased malware on Android devices); (5) how developers would have been affected by the existence of additional app stores and/or multiple Android-based OSs (e.g., greater distribution costs required with multiple stores or multiple OSs); (6) to the extent there is a claim

that there would have been additional apps in the but-for world, the identity, attributes, and quality of those apps; and so on.

29.   Rather than grappling with these important issues regarding the workings of the but-for world, Plaintiffs' experts ignored them and went straight to making claims about a limited set of assumed outcomes in the but-for world, such as the but-for Google Play share and the but-for Google Play service fee rate. Among other things, a company's market share will depend on who its competitors are, what attributes the competitors' services offer, and the strategy that the company uses to compete with these competitors. However, Plaintiffs' experts purport to estimate Google's market share in the but-for world without identifying which app stores would have competed with Google Play, what attributes those stores would have offered developers and consumers, and which monetization strategy Google would have used to try to compete with those app stores. As discussed below, Plaintiffs' experts' attempts to circumvent the problem of having to specify the economic conditions in the but-for world render their analyses invalid and result in conflicts and inconsistencies across their damages models.

B.   Pass-Through of the Service Fee Rate

30.   As noted above, the extent to which app developers charge higher prices for paid app downloads, IAPs, and subscriptions in response to the Google Play service fee rate is a key input to a number of the Plaintiffs' experts' damage calculations. Charging a higher (or lower) price in response to a higher (or lower) marginal cost is often referred to as "marginal cost pass through [or 'pass on']." The "pass-through rate" is defined as the change in price divided by the change in marginal cost. As an illustrative example, when the marginal cost of a given product decreases by one dollar, a pass-through rate of 0% means that the product's price would not change in response

to this change in marginal cost, while a pass-through rate of 100% means that the product's price would also decrease by one dollar.

1. Economic Theory of Pass-Through

31.　　The economics literature has extensively studied marginal cost pass-through.[3] It is well-known that, as a theoretical matter, the pass-through rate can range widely depending on economic conditions such as the shape of the demand curve, substitution possibilities, and the extent of competition. Moreover, other real world market features can also affect the pass-through rate by creating frictions that limit price changes.[4] One example is when there is a fixed cost to a firm changing its prices, such as the cost of analyzing what new price to set. Another example is when a firm has strategic desire to use "focal pricing points," such as setting prices that end in "99."[5] For marginal cost changes of sufficiently small size, a firm may not change its prices to avoid incurring the fixed cost of changing prices or to stay at a particular focal pricing point. For these reasons, it is inappropriate as a matter of economics to assume that the pass-through rate is 100% or any other particular value for a given firm or industry. Instead, the size of the pass-through rate in a given economic context is an empirical question that must be addressed using empirical analysis.

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[3]　See, example.g., J. Bulow and P. Pfleiderer, "A Note on the Effect of Cost Changes on Prices," *Journal of Political Economy*, Vol. 91, 1983; J. Hausman and G. Leonard, "Efficiencies From the Consumer Viewpoint," *George Mason Law Review,* 7, 1999; G. Weyl and M. Fabinger, "Pass-Through as an Economic Tool," *Journal of Political Economy*, Vol. 121, 2013. D. Besanko, *et al.,* "Own-Brand and Cross-Brand Retail Pass-Through," *Marketing Science*, Vol. 24, 2005 provides an empirical analysis that shows that marginal cost pass-through rates can differ even among various products sold in the same supermarkets.

[4]　See, e.g., Deng, Fei, John Johnson, and Gregory Leonard, "Economic Analysis in Indirect Purchaser Class Actions," *Antitrust*, Vol. 26, 2011, pp. 51-57.

[5]　Dr. Singer tries to dismiss focal point pricing as a meaningful friction, even though he did not quantify the impact of focal point pricing on pass-through. Singer Report ¶¶ 405-413. In the context of class-wide impact, Dr. Singer also argues that price stickiness is an important feature in this market. I address his price stickiness argument below.

32.   Unlike many marginal costs that are calculated as a particular amount for each unit of output, Google's service fees are calculated as a percentage of revenue (the service fee "rate"), which economists call an *ad valorem* fee. The pass-through of an *ad valorem* service fee differs in important respects from that of a per-unit marginal cost. One such respect is that, for demand curves of certain shapes, the service fee pass-through rate (i.e., the increase in price due to the service fee divided by the size of the service fee change (in dollars)) tends toward zero as marginal cost (other than the service fee) tends toward zero. This means that, in a market where marginal costs are low (relative to price) – as often is the case with software like apps or in-app purchases of digital goods and subscriptions – the service fee pass-through rate can be at or near zero.[6] It also means that in a context where focal point pricing is prevalent – as is the case here – pass-through is less likely unless a developer can adjust to a new focal point price.[7] Thus, a reliable measure of the service fee pass-through rate must be determined using an empirical analysis of the marketplace at issue; the service fee pass-through rate cannot be assumed to be a certain level or determined using only theory.

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[6]   This can be true even for demand curve shapes for which the marginal cost pass-through rate remains sizable as marginal cost tends toward zero.

[7]   The prices of many paid downloads, IAPs, and subscriptions are set to end in "99," such as $0.99, $1.99, and $4.99. Based on the Google Play transactions data, during the period from August 2016 to July 3, 2021, ▮▮▮ U.S. consumers' app transactions were set such that the retail prices ended in "99." Specifically, price is $0.99 for ▮▮ of U.S. consumers' transactions, $1.99 for ▮▮ of the transactions, $4.99 for ▮▮ of the transactions, and $9.99 for ▮▮ of the transactions, and other price points ending at "99" for ▮▮ of the transactions. The percentage reduction can be as large as 50% from one focal price point to the next one, such as from $1.99 to $0.99. Dr. Singer argues that the observed prevalence of focal pricing in the actual data is due to Google's anti-steering policy. Singer Report ¶ 405 ("A key reason we do not see as much deviation from focal-point pricing in the actual world is that developers are not afforded the opportunity to steer due to the Aftermarket Restrictions."). In other words, Dr. Singer claims that if there is a lower-cost competitor, then one should not observe as many focal prices on Google Play store. The implication that no steering leads to focal pricing makes little sense. Focal pricing is observed in many markets and Dr. Singer does not point to a single study that links focal pricing to the type of steering he considers critical. As noted above, Dr. Singer does not quantify the impact of observed focal pricing on pass-through.

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33.   In the context of app pricing, it is also possible to observe negative pass-through. This stems from the fact when it comes to monetization, developers have multiple options. They can offer free apps and monetize through advertising; they can offer paid downloads, IAPs, and subscriptions; they can use a combination of both paid content and advertising. All else equal, consumers prefer a lower price and less advertising. From a developer's perspective, trading off consumers' preferences for a lower price and less advertising is an important consideration when choosing ways to monetize. This is widely understood in practice and has become a subject of recent academic research.[8] For example, it is common for developers to offer free apps supported by advertising which can be removed or reduced if consumers make a payment. With a service fee rate reduction, the developer may have the incentive to shift its monetization strategy toward a higher price and less advertising, implying a negative pass-through rate. The following simple example illustrates the intuition. Suppose a developer monetizes through both paid content and advertising. Following a service fee rate reduction, the developer may find it more profitable to increase the price (hence making more profit per sale) and lower the intensity of advertising (hence forgoing advertising revenue but at the same time limiting the reduction in consumer demand due to consumers' preference for less advertising). The more consumers value the app and the more consumers dislike advertising, the more appealing this change in pricing strategy may be for the developer. This would lead to a negative pass-through. These real world complexities that both Dr. Singer and Dr. Rysman ignore further emphasize the importance of treating the pass-through rate as an empirical question. Both Dr. Rysman and Dr. Singer recognize the practical importance

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[8]   See, e.g., Lambrecht, A., Goldfarb, A., Bonatti, A. et al. How do firms make money selling digital goods online?. Mark Lett 25, 331–341 (2014).

of advertising to developers. However, both fail to consider the fact that the choice between advertising and paid content can lead to negative pass-through as I discussed here.[9]

2. Empirical Analysis of the Google Play Service Fee Pass-Through Rate

34.   Google has implemented multiple service fee rate reductions during the class period, with the most recent two occurring on July 1, 2021 and January 1, 2022. The July 1, 2021 change reduced the Google Play service fee rate to 15% for the first $1 million of a developer's global gross earnings from paid downloads and in-app purchases (including subscriptions) in each calendar year after they complete enrollment;[10] and the January 1, 2022 change reduced the Google Play service fee rate to a flat 15% for all subscription sales through the Google Play store.[11] The service fee rate reductions can be used as "natural experiments" to analyze empirically how app developers in the real world adjust their prices when the service fee rate decreases.

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[9]   See, e.g., Singer Report ¶ 132 ("Google's conduct vis-à-vis developers—including preventing developers from steering users to rival stores and conditioning developers' access to valuable advertising programs") ¶ 214 ("This conduct further entrenched Google's monopoly in the Android App Distribution Market by coercing developers to list their Apps in the Play Store or risk losing advertising access to some of the Internet's most effective advertising space."). Dr. Rysman made a similar argument. See, for example, Rysman Report footnote 592 ("… some developers do not monetize their in-app content,…, monetizing their app in other ways (e.g., through advertising)") and ¶ 465, arguing that that Google App Campaigns provide many useful services to app developers and advertisers and Google's limitation on Google App Campaign "discourages Android App Distribution competition."

[10] The service fee rate reverts to 30% once the $1 million annual cap (partial year cap of $500,000 for 2021) is reached. Developers must complete enrollment to receive the reduced 15% service fee rate. As noted by Google, the 15% service fee tier will go into effect on July 1, 2021 for all developers who have completed enrollment before this date; for developers who complete enrollment after July 1, 2021 the 15% will be applied starting from the date when enrollment is completed. "Changes to Google Play's service fee in 2021", Play Console Help, https://support.google.com/googleplay/android-developer/answer/10632485; https://www.cnbc.com/2021/03/16/google-app-store-fees-cut-for-developers-on-first-million-in-sales.html: "After developers cross the $1 million in sales for a year, Google will charge developers its standard 30% fee for in-app purchases and downloads.")]

[11] "Evolving Our Business Model to Address Developer Needs," Android Developers Blog, October 21, 2021, https://android-developers.googleblog.com/2021/10/evolving-business-model.html.

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35.   Overall, I found little evidence of systematic pass-through and my econometric estimates of the pass-through rate are small and not statistically significantly different from zero.

a. Real-World Examples Show Little Evidence of Pass-Through in Response to Reductions in the Google Play Service Fee Rate

36.   In this section, I compare prices of the top paid apps, IAPs, and subscription items (or "SKUs"), before and after the SKU had a service fee rate change using Google Play's transactions data. The results show that very few of these top paid apps, IAPs, or subscriptions experienced a price decrease following a reduction in the service fee rate.

i.   Paid Apps

37.   First, I analyze what happened to the prices of paid apps following the July 1, 2021 service fee reduction. Because this rate reduction applies to a developer's first $1 million of annual global gross earnings once they enroll, the effective service fee rate reduction for a given app can be as much as 15 percentage points (if the app developer's annual gross earnings remain below $1 million[12]) or a figure less than 15 percentage points (if the app developer enrolls and their annual gross global earnings exceed $1 million during the relevant period).

38.   I first look at paid apps with the most pronounced change in service fee, i.e., paid apps with a service fee reduction of 15 percentage points (i.e., paid apps for which the service fee rate decreased from 30% to 15%) after July 1, 2021 and compare their prices before and after the service fee rate reduction.[13] As shown in Table 1, among the top 100 paid apps in this group,

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[12]   "Changes to Google Play's service fee in 2021," Play Console Help, https://support.google.com/googleplay/android-developer/answer/10632485.

[13]   I restrict the sample to paid apps that (1) had non-zero sales in every month between July 2020 and May 2022, (2) were subject to a 30% service fee rate in every month between July 2020 and June 2021, and (3) were subject to a 15% service fee rate in every month between July 2021 and May 2022. Among these paid apps, the top 100,

comparing price during the one year after July 1, 2021 to the price in the one year preceding July 1, 2021, there is little change in the average before and after period prices (████ vs. ████); specifically, price was unchanged for █ apps, price increased for █ apps, and price decreased for only █ apps.[14] Figure 1 presents, as an example, the monthly app prices and service fee rates for ████████████, the top paid app in this group ranked by consumer spend.[15] This shows that very few paid apps that experienced a service fee rate reduction of 15 percentage points decreased their prices following the reduction. That is, there is little evidence of positive pass-through in response to the service fee rate reduction.

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ranked by consumer spend between July 2020 and May 2022, account for ████ of the total consumer spend in the sample.

[14] I use the pre-change period of July 2020 to June 2021 and the post-change period of July 2021 to May 2022, since the Google Play transactions data covers transactions through May 31, 2022. I analyze price changes based on both the list price and the net price. In order to account for price fluctuations of very small magnitude, a price change of less than or equal to 1% (i.e., ██████████) is considered as no price change. To gauge how likely it is that general inflation affects app-related prices, I also examined the relationship between inflation, as measured by the consumer price index and prices of paid download, IAPs, and subscriptions in the recent history and found no statistically significant relationship. I note that my econometric analysis of the pass-through accounts for inflation provided that inflation affects SKUs the same way, on average.

[15] See Exhibit 35a for the monthly app prices and service fee rates between July 2020 and May 2022 of the top 100 apps in this paid app group.

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Table 1.   **Price Changes of the Top 100 Paid Apps with A Flat Service Fee Rate Reduction of 15 Percentage Points After July 2021**

July 2020 – June 2021 vs. July 2021 - May 2022

	Total	No Price Change	Price Increase	Price Decrease
Based on List Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average List Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% List Price Change				
Based on Net Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average Net Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% Net Price Change				

Source: See Exhibit 1a.

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Figure 1.   Average Monthly Product Price and Service Fee Rate of ████████████
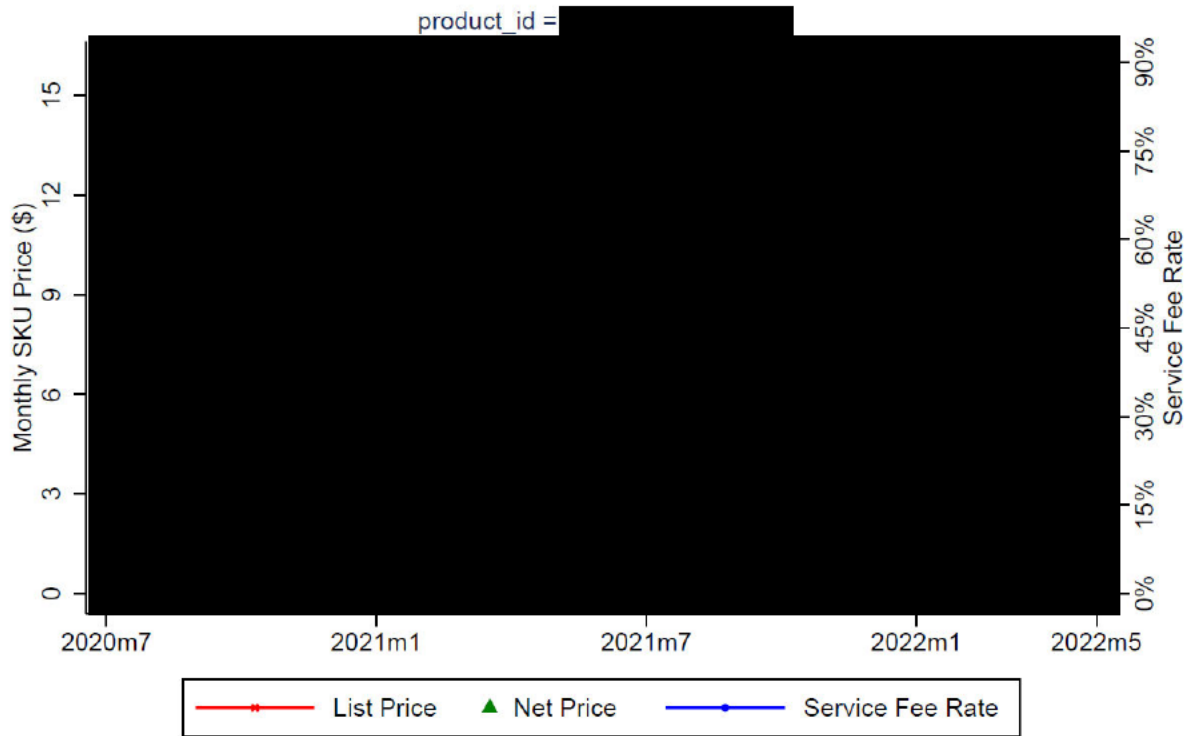
Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 1.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category); 93% (for the corresponding app developer).

Source: See Exhibit 35a.

39.   Next, I analyze paid apps that experienced a service fee rate reduction of at least 10 percentage points in July 2021. The service fee rate could jump back to 30% after July 2021 and the service fee reduction is at most 15 percentage points for this group of apps.[16] Thus, this group of apps is inclusive of the first group with a flat 15 percentage points service fee rate reduction.[17]

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[16]   I restrict this sample to paid apps that had a service fee rate reduction of at least 10% in July 2021 (and with non-zero sales in every month between July 2020 and May 2022, subject to a 30% service fee rate in every month between July 2020 and June 2021). I did not require that the service fee rate remain below 30% after July 2021, which allows the sample to include paid apps that exceeded the policy's annual $1M cap ($0.5M for 2021) between July 2021 and May 2022. Among these paid apps, the top 100, ranked by consumer spend between July 2020 and May 2022, account for ██████ of the total consumer spend of the sample.

[17]   The top 100 paid apps in the group with a flat 15% service fee rate reduction and in this group thus overlap with ████ paid apps in the former group also being in this group.

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As shown in Table 2, similar to the first group, the average prices of these 100 paid apps before and after the service fee rate reduction show a small increase of ▊▊▊▊ out of the top 100 paid apps in this group had no price change between one year before and after July 1, 2021, ▊ had a price increase, and only ▊ had a price decrease. The top paid app in this group, ▊▊▊▊▊▊▊▊▊▊, ▊▊▊▊▊▊▊▊▊▊▊▊, shows a price increase after July 1, 2021, despite having service fee reductions. See Figure 2.[18]

Table 2.   **Price Changes of the Top 100 Paid Apps with A Service Fee Rate Reduction of At Least 10 Percentage Points in July 2021**
July 2020 – June 2021 vs. July 2021 - May 2022

	Total	No Price Change	Price Increase	Price Decrease
Based on List Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average List Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% List Price Change				
Based on Net Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average Net Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% Net Price Change				

[18]   See Exhibit 35b for the monthly app prices and service fee rates between July 2020 and May 2022 of the top 100 apps in this paid app group.

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Source: See Exhibit 1b.

Figure 2.   Average Monthly Product Price and Service Fee Rate of ████

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 1.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category); 49% (for the corresponding app developer).
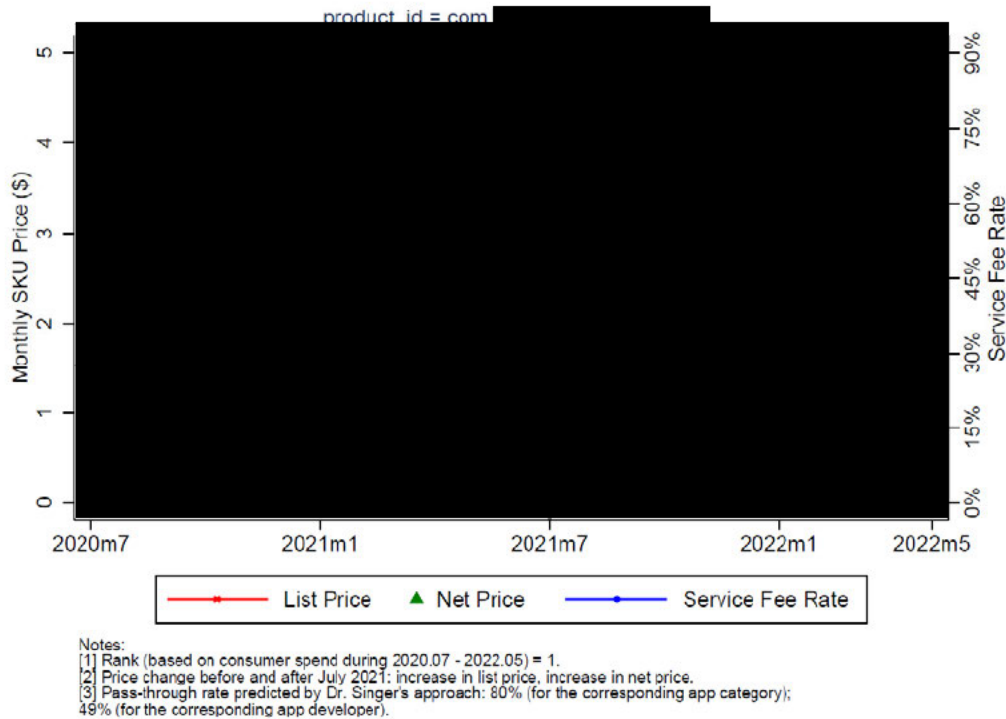
Source: See Exhibit 35b.

40.   Lastly, I analyze the prices of the top 100 paid apps ranked by consumer spend among all paid apps. For this group of apps, the service fee rate is between 15% and 30% since July 2021 and the service fee reduction is at most 15 percentage points. On average for this group, the service fee rate decreased from ████ [19] Therefore, this group of top apps experienced smaller (relative to the first two groups discussed above) or no service fee rate reduction. The price changes of apps with no service fee reduction would reflect any common trend in prices driven by

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[19] This sample includes all paid apps and is inclusive the first two groups (with a flat 15% service fee rate reduction and with a service fee rate reduction of at least 10% in July 2021). These top 100 paid apps account for ████ the total consumer spend of all paid apps between July 2020 and May 2022. ████

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other factors.[20]   Similar to the first two groups, Table 3 shows that on average there was a small increase in app prices after July 1, 2021; ▮ of these 100 paid apps had no price change one year before and after July 1, 2021, ▮ had a price increase, and only ▮ had a price decrease. The top paid app, ▮▮▮▮ which experienced a small service fee reduction in July 2021 and January 2022 (due to reset of the annual cap), showed no price reduction after the July 1, 2021 service fee reduction. See Figure 3.[21]

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[20]   As discussed below, the price changes for these apps are also informative about the potential interdependence between the apps with a service fee reduction and those without.

[21]   See Exhibit 35c for the monthly app prices and service fee rates between July 2020 and May 2022 of the top 100 apps in this paid app group.

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Table 3.   **Price Changes of the Top 100 Paid Apps**

July 2020 – June 2021 vs. July 2021 - May 2022

	Total	No Price Change	Price Increase	Price Decrease
Based on List Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average List Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% List Price Change				
Based on Net Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average Net Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% Net Price Change				

Source: See Exhibit 1c.

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Figure 3.   **Average Monthly Product Price and Service Fee Rate of** ████████

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 1.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category); 60% (for the corresponding app developer).
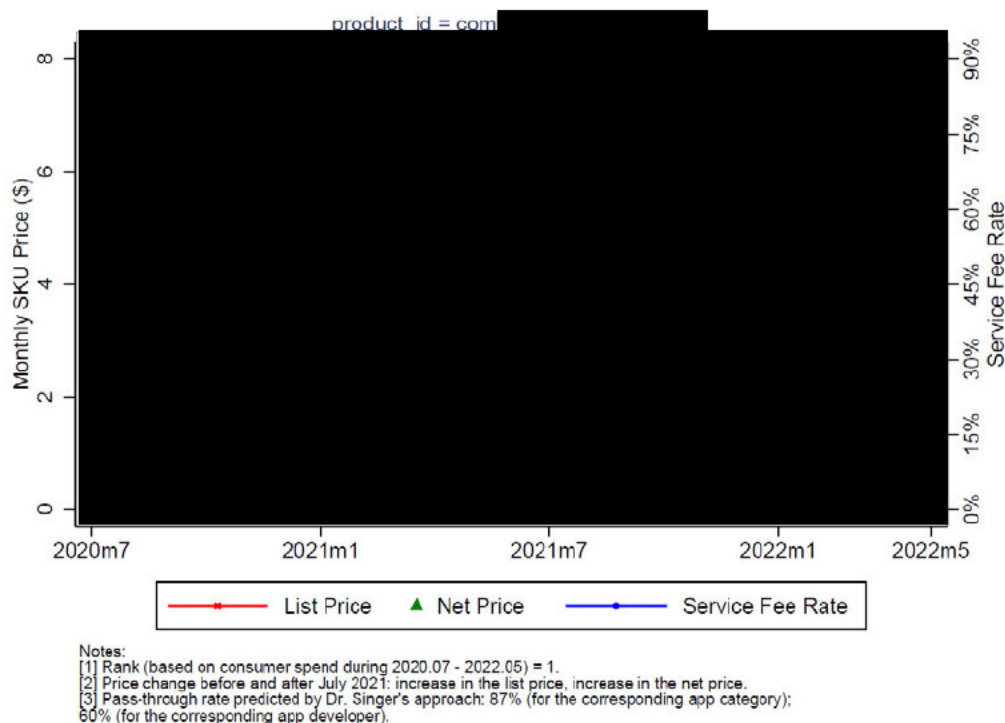
Source: See Exhibit 35c.

ii.   IAPs

41.   Similar to paid downloads, I also analyzed the price changes of IAPs following the July 1, 2021 service fee reduction.[22] The effective service fee rate reduction for a given IAP can be 15 percentage points or less, depending on the size of its developer's total annual gross earnings once they enroll. I first look at the group of IAPs with the most pronounced change in service fee, i.e., IAPs with a service fee reduction of 15 percentage points (i.e., service fee rate reduced from 30% to 15%) after July 1, 2021.[23] As shown in Table 4, among the top 100 IAPs in this group, there

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[22] I look at price changes of IAPs at the stock-keeping units (or SKU) level, as identified by the product ID field in the Google Play transactions data.

[23] I restrict the sample to IAPs with non-zero sales in every month between July 2020 and May 2022, subject to a 30% service fee rate in every month between July 2020 and June 2021, and subject to a 15% service fee rate in

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was a small price increase of ██ after the service fee rate reduction; ██ had no price change one year before and after July 1, 2021, ██ had a price increase, and only ██ had a price decrease. The monthly app prices and service fee rates of the IAP SKU ████████████████ ███████████████████████ of the app ████████████████ the top one IAP by consumer spend in this group, shows that the prices of this IAP actually increased right before the service fee rate reduction occurred and stayed flat afterwards. See Figure 4.[24]

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every month between July 2021 and May 2022. Among these IAPs, the top 100, ranked by consumer spend between July 2020 and May 2022, account for ██ of the total consumer spend of the sample.

[24]   See Exhibit 36a for the monthly app prices and service fee rates between July 2020 and May 2022 of the top 100 IAPs in this IAP group.

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Table 4.   **Price Changes of the Top 100 IAPs with A Flat Service Fee Rate Reduction of 15 Percentage Points After July 2021**

July 2020 – June 2021 vs. July 2021 - May 2022

	Total	No Price Change	Price Increase	Price Decrease
Based on List Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average List Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% List Price Change				
Based on Net Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average Net Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% Net Price Change				

Source: See Exhibit 2a.

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Figure 4.   Average Monthly Product Price and Service Fee Rate of the IAP SKU ███ of the App

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 1.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 79% (for the corresponding app category); 97% (for the corresponding app developer).

Source: See Exhibit 36a.

42.   I next analyze IAPs that had a service fee rate reduction of at least 10 percentage points and at most 15 percentage points in July 2021.[25] This group of IAPs is inclusive of the first group of IAPs with a flat 15% service fee rate reduction.[26] As shown in Table 5, there was no price change with these 100 IAPs on average; specifically, ██ of the top 100 IAPs in this group had no price change one year before and after July 1, 2021, █ had a price increase, and only ██ had a price decrease. The monthly average price of the top IAP in this group, ██████ associated

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[25] I restrict the sample to IAPs that had a service fee rate reduction of at least 10% in July 2021 (and with non-zero sales in every month between July 2020 and May 2022 and subject to a 30% service fee rate in every month between July 2020 and June 2021). I do not require the service fee rate to remain below 30% after July 2021, which allows the sample to include IAPs that exceeded the policy's annual $1M cap ($0.5M for 2021) between July 2021 and May 2022. Among these IAPs, the top 100, ranked by consumer spend between July 2020 and May 2022, account for ████ of the total consumer spend of the sample.

[26] Two IAPs in this group are also in the first group of IAPs with a flat service fee rate reduction of 15%.

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with the app ███████████████████ remains the same before and after July 2021, despite

the service fee reduction. See Figure 5.[27]

Table 5.   **Price Changes of the Top 100 IAPs with A Service Fee Rate Reduction of At Least 10 Percentage Points in July 2021**

July 2020 – June 2021 vs. July 2021 - May 2022

	Total	No Price Change	Price Increase	Price Decrease
Based on List Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average List Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% List Price Change				
Based on Net Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average Net Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% Net Price Change				

Source: See Exhibit 2b.

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[27]   See Exhibit 36b for the monthly app prices and service fee rates between July 2020 and May 2022 of the top 100 IAPs in this IAP group.

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Figure 5.   Average Monthly Product Price and Service Fee Rate of the IAP SKU ████████████ of the App ████████████

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 1.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category); 99% (for the corresponding app developer).
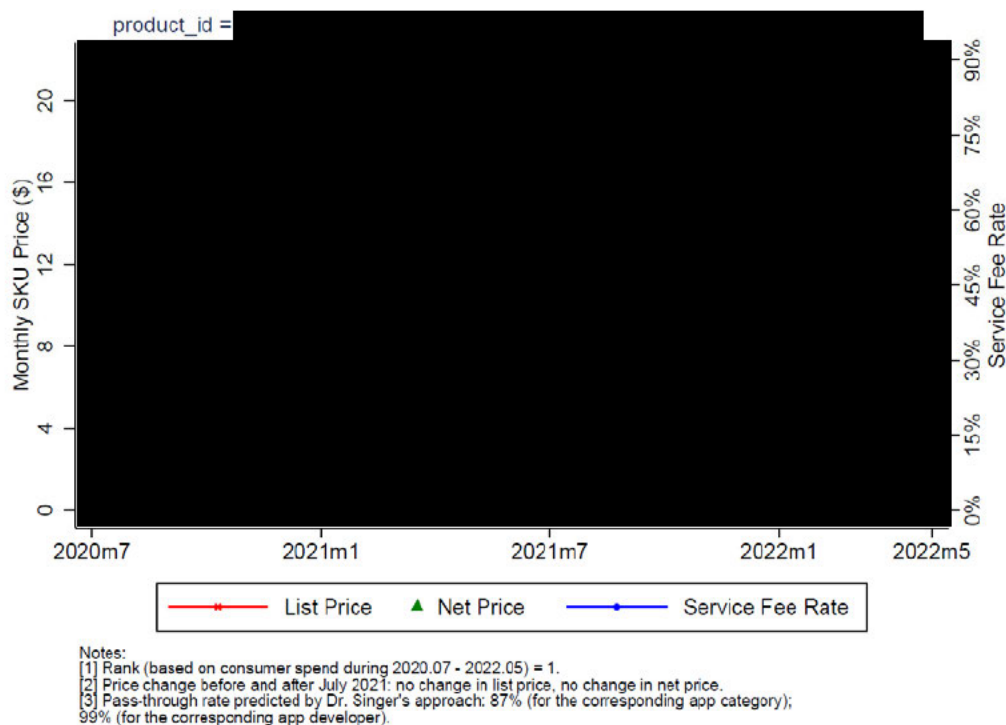
Source: See Exhibit 36b.

43.   Lastly, I compare prices of the top 100 IAPs ranked by consumer spend among all the IAPs.[28] This group of top 100 IAPs experienced no service fee rate reduction and the price changes of these IAPs would reflect any common trend in prices driven by other factors.[29] As shown in Table 6, on average there was no change in app prices after July 1, 2021; ████ of these 100 IAPs had any change in the list price one year before and after July 1, 2021, and only ████ had a net price

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[28]   These top 100 IAPs are ranked by consumer spend between July 2020 and May 2022 among all IAPs. These IAPs are inclusive of the first groups of IAPs and experienced virtually no change in the service fee rate. They account for ████ of the total consumer spend of all IAPs between July 2020 and May 2022. Many of these IAPs are attached to popular game apps such as ████████████████████████████████ ████████.

[29]   As discussed below, the price changes for these apps are also informative about the potential interdependence between the apps with a service fee reduction and those without.

decrease.[30] The top IAP, ████████████████████████ associated with the popular game app

█████████████ had no change in either the list or net price following the July 1, 2021 service

fee reduction. See Figure 6.[31]

Table 6.   Price Changes of the Top 100 IAPs

July 2020 – June 2021 vs. July 2021 - May 2022

	Total	No Price Change	Price Increase	Price Decrease
Based on List Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average List Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% List Price Change				
Based on Net Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average Net Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% Net Price Change				

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[30] Furthermore, the empirical evidence does not suggest that developers launched new IAPs with lower prices to replace existing IAPs as a way to pass through the service fee rate reductions. Among the apps in the three groups of top 100 IAPs discussed above, only a number of those ███████████ in the first group, ████████ apps in the second group, and ███████ apps in the third group) launched any new SKUs in the period after July 1, 2021. Even for these cases, the prices of the new IAPs are in some cases higher and in other cases lower than the average prices of the existing IAPs. In addition, the monthly average consumer spend on the new IAPs is ████████████████████████ during July 2021 to May 2022, and the percentages of consumer spend accounted for by the newly launched IAPs during the period following the July 2021 service fee rate reduction (from July 2021 to December 2021) are generally ████████████████████ ████████████, which does not appear to suggest that developers tend to resort more heavily on launching new IAPs in order to pass on the service fee rate reduction compared to the same time period in the year before the service fee rate reduction. See Exhibits 3a-3c.

[31] See Exhibit 36c for the monthly app prices and service fee rates between July 2020 and May 2022 of the top 100 IAPs in this IAP group.

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Source: See Exhibit 2c.

Figure 6.   Average Monthly Product Price and Service Fee Rate of the IAP SKU of the App ▮▮▮▮
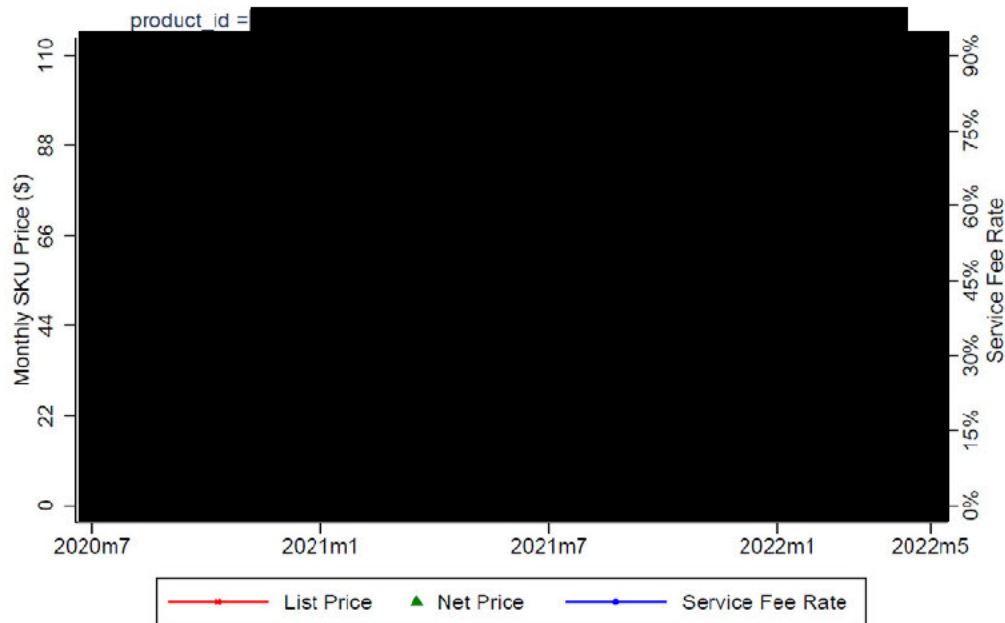
Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 1.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category); 94% (for the corresponding app developer).

Source: See Exhibit 36c.

iii.   Subscriptions

44.   Google has reduced the service fee rate for subscriptions multiple times, including the January 1, 2018 change when Google reduced the service fee rate for subscriptions to 15% after a consumer had subscribed for one year[32] and the January 1, 2022 change when Google reduced the

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[32] "Google Play Lowers App Subscription Fee to 15 Percent, Matches Apple's Offering," Gadgets 360, October 20, 2017, https://gadgets ndtv.com/apps/news/google-play-app-subscription-fee-30-percent-to-15-1764923. Google's subscription fee rate reduction followed Apple's 2016 rate reduction on subscriptions. See "Apple Announces it Will Offer App Store Subscriptions to All Apps, Take Smaller 15% Cut," Apple Insider, June 8, 2016, https://appleinsider.com/articles/16/06/08/apple-announces-it-will-offer-app-store-subscriptions-take-smaller-15-cut.

service fee rate for all subscriptions to 15%.[33]   Below I show with Tinder's subscription products
(SKUs) that there is little or no evidence of pass-through in response to reductions in the Google
Play service fee rate.

45.   Tinder has █ subscription SKUs with non-zero sales during the class period of August
2016 to May 2022, of which █ incurred non-zero sales before and after the July 1, 2021 and
January 2022 service fee rate reductions.[34]   As shown in Table 7, the average service fee rate of
these ████████ SKUs decreased to 15% starting in January 2022, and the average list price
of these SKUs *increased* from about █ during July 2020 and June 2021 to about █ in the first
five months of 2022.[35]   Further, when comparing each subscription SKU's average list prices
before and after the January 2022 service fee rate reduction, █ subscriptions out of the █ did
not have any price change, █ had a price increase, and only █ had a price drop. The █
subscriptions with price drops account for only █ of the total consumer spend of the █
subscriptions during the period of July 2020 to May 2022.[36]

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[33] "Evolving Our Business Model to Address Developer Needs," Android Developers Blog, October 21, 2021,
      https://android-developers.googleblog.com/2021/10/evolving-business-model.html.

[34] I included Tinder's subscription SKUs that incurred sales during each of the three time periods as shown in
      Table 7.

[35] The service fee rates of the █ subscriptions analyzed in Table 7 differ before January 2022 due to differences
      in their sales portions from subscriptions longer than one year (which were subject to a 15% service fee rate,
      starting from the January 2018 Google Play subscription service fee rate reduction) and from subscriptions less
      than one year (which were subject to a 30% service fee rate, since the January 2018 Google Play subscription
      service fee rate reduction only applies to subscriptions longer than one year).

[36] The total consumer spend on the █ subscription SKUs during the period from July 2020 to May 2022 is
      ██████, close to that of the █ subscription SKUs (██████, as shown in Table 7). I show in Exhibit
      4b that similar results are obtained with Tinder's subscription SKUs with non-zero originating sales. Originating
      sales refer to the first payment for a recurring app subscription. See 2021.10.11 B. Rocca Letter to G. Arenson
      re Transactional Data.

Table 7.   Price Changes of Tinder's Subscription Products

	Total	July 2020 - June 2021 v. July 2021 - Dec. 2021			July 2021 - Dec. 2021 v. Jan. 2022 - May 2022		
		No Price Change	Price Increase	Price Decrease	No Price Change	Price Increase	Price Decrease
Based on List Price							
Count of SKUs							
Consumer Spend ($)							
Consumer Spend (%)							
Average Service Fee Rate							
2020.07 - 2021.06 (Period 1)							
2021.07 - 2021.12 (Period 2)							
2022.01 - 2022.05 (Period 3)							
Average List Price							
2020.07 - 2021.06 (Period 1)							
2021.07 - 2021.12 (Period 2)							
2022.01 - 2022.05 (Period 3)							
% List Price Change							
Period 1 v. Period 2							
Period 2 v. Period 3							
Based on Net Price							
Count of SKUs							
Consumer Spend ($)							
Consumer Spend (%)							
Average Service Fee Rate							
2020.07 - 2021.06 (Period 1)							
2021.07 - 2021.12 (Period 2)							
2022.01 - 2022.05 (Period 3)							
Average Net Price							
2020.07 - 2021.06 (Period 1)							
2021.07 - 2021.12 (Period 2)							
2022.01 - 2022.05 (Period 3)							
% Net Price Change							
Period 1 v. Period 2							
Period 2 v. Period 3							

Source: See Exhibit 4a.

46.   As further illustrated by the monthly subscription prices and service fee rates for Tinder's top 100 subscriptions ranked by either total consumer spend or originating consumer spend in Exhibits 37a and 37b, the monthly prices of the top 100 subscriptions either ███████████ ████████████████████████ before and after the January 2022 service fee reduction. Thus,

the data do not show any evidence that Tinder decreased its subscription prices after the service

fee rate reduction in January 2022.[37]

b.   Econometric Esimates of Pass-Through

47.   In this section, I econometrically estimate the pass-through rate using the actual observed

service fee changes in the recent history.

48.   Specifically, as discussed above, starting from July 1, 2021, Google lowered the service

fee rate for a developer's first $1 million annual global revenue from 30% to 15%, provided that

the developer enrolls in the program. As a result, developers who enroll in the program pay 15%

after July 1, 2021, while developers who do not enroll continue to pay 30% service fee on their

paid downloads and IAPs.[38] Therefore, comparing and contrasting the price changes *before and*

after Google's service fee rate change *between* the paid downloads and IAPs offered by these two

types of developers allows me to quantify the extent of pass-through for paid downloads and IAPs.

49.   For subscriptions, a group of subscription products paid more than 15% before July 1, 2021

and started paying a lower 15% rate after July 1, 2021 provided that their developers enroll in the

program after the July 1, 2021 service fee reduction before reaching the first $1 million annual

global revenue cap. The service fee rate for all subscription products was reduced to a flat 15%

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[37]   The empirical evidence does not suggest that Tinder launched new subscription SKUs with lower prices to replace existing subscription SKUs as a way to pass through the service fee rate reductions. During January 2022 and May 2022, Tinder launched ▮ new subscription SKUs, ▮▮▮. This does not support that these new SKUs were launched to replace the popular existing subscription SKUs. Compared to January 2021 to May 2021, ▮▮ ▮▮▮▮▮▮▮, which again does not appear to suggest that Tinder tend to resort more heavily on launching new apps in order to pass on the service fee rate reduction compared to the same time period in the year before the service fee rate reduction.

[38]   There is also a small group of developers whose service fee rate stays close to 30% since their annual revenue far exceeds $1 million.

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after another service fee rate reduction for subscriptions since January 1, 2022.[39] Another group of subscription products that were either in a developer deal program (e.g., ███████████) or their sales before July 1, 2021 mostly (or entirely) consisted of sales from subscribers lasting more than 12 months (hence were subject to 15% since the January 1, 2018 subscription rate change) are subject to a constant 15% service fee rate when the service fee rate for the first group of subscription products reduced.[40] Therefore, comparing the price changes *before and after* Google's service fee rate change *between* these two groups of subscription products allows me to quantify the extent of pass-through for suscriptions.

50.   The intuition is as follows. Suppose there are two similar products A and B. Product A, known as a "control unit" in econometric terms, paid the 30% service fee rate both before and after the policy change and product B, known as a "treatment unit" in econometric terms, experienced a change in its service fee in July 2021. Any change in the price of product A can be understood as being driven by market factors unrelated to the policy change. Product B, on the other hand, was not only subject to the same market forces as product A but also the service fee rate change. Therefore, the difference between the price changes in product B and product A, before and after the service fee rate change, is a measure of the impact on the price of product B that is attributable to the service fee rate change alone. Because I have multiple treatment and control units in the data, I use a methodology specifically designed for such a situation. The methodology is an

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[39] "Google Play Lowers App Subscription Fee to 15 Percent, Matches Apple's Offering," Gadgets 360, October 20, 2017, https://gadgets ndtv.com/apps/news/google-play-app-subscription-fee-30-percent-to-15-1764923; "Evolving Our Business Model to Address Developer Needs," Android Developers Blog, October 21, 2021, https://android-developers.googleblog.com/2021/10/evolving-business-model html.

[40] ██
███
███████████████ See GOOG-PLAY-001291192; GOOG-PLAY-000604733; GOOG-PLAY-003335786.R; GOOG-PLAY-003331764.

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extended version of the well-established econometric method known as Synthetic Control.[41]   This method is a formal way to combine the control units in an optimal fashion in creating a benchmark for the treated group.   I perform the econometric analysis for paid downloads, IAPs, and subscriptions separately.   See Appendix C for a detailed discussion of the methodology, the data construction and robustness checks.

51.   Table 8 summarizes the results of my econometric analysis. I find that the service fee pass-through rate is not distinguishable from zero statistically for paid downloads, IAPs, or subscriptions.   To be conservative, however, in various analyses described below that require an estimate of the service fee pass-through rate, I use the upper bounds of the 95th confidence intervals for pass-through rates, which are 10.6% for paid downloads, 2.0% for the IAPs, and 9.7% for subscriptions.   The weighted average pass-through rate (based on the upper bound of the 95th confidence intervals) across the three types of transactions is 3.0%.

Table 8.   Estimates of Pass-Through Rate

	IAPs	Paid Downloads	Subscriptions
Pass-Through Rate	-3.3%	-0.3%	-1.3%
Pass-Through Rate (Upper Bound)			
P-Value			
Number of Treated SKUs			
Number of Control SKUs			
Number of SKU-Month Obs.			
Total Consumer Spend (8/16/16-5/31/22)			
Weighted Average Pass-Through Rate		3.0%	

Source: See Exhibit 5.

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[41]   Robbins, M. W., Saunders, J., Kilmer, B. (2017). A Framework for Synthetic Control Methods With High-Dimensional, Micro-Level Data: Evaluating a Neighborhood-Specific Crime Intervention, Journal of the American Statistical Association (517), 109–126; Abadie, Alberto. 2021. "Using Synthetic Controls: Feasibility, Data Requirements, and Methodological Aspects," Journal of Economic Literature, 59 (2): 391-425.

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52.   To the extent Plaintiffs' experts attempt to explain the finding of small service fee pass-through by arguing that that the developers who received the service fee reductions from Google or their customers were not "price-sensitive," they would be incorrect because the pass-through rate is not determined solely by "price-sensitivity."[42] For example, in Dr. Rysman's model, the service fee pass-through rate is always 100%, regardless of the price-sensitivity of demand. Moreover, there is no evidence to support the claim that the price-sensitivity of demand for the paid downloads, IAPs, and subscriptions receiving the discount was greater than the price-sensitivity of demand for the paid downloads, IAPs, and subscriptions that did not receive the discount.

53.   Dr. Singer argues that price stickiness, "which arises due to well-understood behavioral economic phenomena such as consumer anchoring, tend to limit pass-through in the actual world, …"[43]. Therefore, to the extent Dr. Singer and Plaintiffs' other experts attempt to explain the finding of small service fee pass-through by arguing that there is price stickiness that prevented price changes within the time frame I have analyzed, this argument fails to recognize that any such price stickiness also would be present in the but-for world and would prevent the pass-through of a lower but-for service fee.   In other words, price stickiness is an important real world phenomenon; it does not undermine my econometric results; rather, it undermines Plaintiffs' experts' damages calculations that entirely ignore price stickiness and therefore overstate pass-

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[42] The marginal cost pass-through rate may not depend at all upon price-sensitivity of demand. For example, with linear demand, the pass-through rate of a marginal cost change is 50% regardless of the price-sensitivity. Dr. Singer recognizes this as well, see Singer Class Rebuttal Report ¶ 74 ("For example, as pointed out in the Singer Report, whenever the demand curve is assumed to be linear, the pass-through rate is always exactly 50 percent, regardless of how steep or flat the curve is.") and Singer Report ¶ 336 ("For example, with a linear demand curve (a downward slopoing straight line), even in monopolistic markets, at least half of marginal cost savings are passed through to customers.")

[43] Singer Report ¶ 370.

through. In addition, as discussed above, small service fee pass-through can be the result of a number of factors, including the shape of the demand curve and a low level of marginal cost. These factors would operate to limit pass-through in the short run and the long run. Thus, any claim by Plaintiffs' experts that pass-through would be greater in the "long run" than I found in my analysis would require that they demonstrate that price stickiness is the only or primary cause of the small pass-through that I found. Even then, they would have to define empirically the "long run" in this context. If the "long run" were, say, years, price stickiness could limit service fee pass-through in Plaintiffs' experts' but-for worlds for a significant portion of the damages period. I note that while insisting that price stickiness limits pass-through in the short run, Dr. Singer neverthess in his Class Rebuttal Report argues that "the basic economic logic of pass-through applies both to short-run and long-run profit maximization. *In the short run, positive marginal costs are sufficient to generate pass-through given a change in the take rate*."[44] [Emphasis added]

54.   To the extent that Plaintiffs' experts attempt to argue that the small service fee pass-through I found was due to the apps that did not receive the service fee reductions lowering their prices anyway, perhaps due to competition with the apps that did receive the service fee reduction, this argument is both inconsistent with Plaintiffs' experts' assumptions regarding app demand and is unsupported empirically. In Dr. Rysman's model, an app will exhibit 100% service fee pass-through even if it is the only app receiving the reduction in service fee; conversely, in his model, an app will not lower its price if it did not receive a service fee reduction, even if other apps did. See Appendix E for a proof of this result. Similarly, with the logit demand model used by Dr. Singer, an app receiving a service fee reduction will exhibit pass-through, but apps not receiving

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[44]   Singer Class Rebuttal Report ¶ 31.

a service fee reduction exhibit minimal price changes. Thus, under either of Plaintiffs' experts' models of demand, apps receiving a service fee reduction would have a markedly different price response than even competing apps that did not receive the service fee reduction. Accordingly, the latter group is an appropriate control for the former group under Plaintiffs' experts' own assumptions regarding app demand. However, I also empirically investigated this issue by running the analysis on the subset of transactions associated with apps in categories where the apps receiving the reduced service fees made up only a relatively small percentage of the category's transactions. While the apps receiving the reduced service fee would still have an incentive to reduce their prices (subject to the other conditions necessary for positive pass-through), other apps in the category would not because the former group would not have a strong competitive effect on the latter group. I find the same small service fee pass-through rate for this subset of the data.[45]

VI.   CONSUMERS – DR. SINGER'S DAMAGES CALCULATIONS

A.   Overview of Dr. Singer's Damages Calculations

55.   Dr. Singer calculates consumer damages based on alleged (service fee) overcharges, consumer subsidies, and a combination of overcharges and consumer subsidies, and uses several different approaches in doing so. In all, he has six calculations.

56.   The first calculation is an overcharge calculation for Dr. Singer's "app distribution" market, i.e., paid app downloads, which Dr. Singer refers to as the "Android app distribution market model" (hereafter "Singer app distribution market model").[46] Dr. Singer uses a theoretical two-sided platform model based on Rochet and Tirole (2003) to predict Google's but-for service

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[45]   See Appendix C.

[46]   Singer Report ¶ 288.

fee rate for paid downloads.[47]   Using this but-for service fee rate and an assumption regarding the pass-through rate, he calculates the overcharges paid by consumers on paid downloads. In this calculation, he assumes that the consumer subsidies, as a percentage of the app price, would have been the same in the but-for world as in the actual world.[48]

57.   The second calculation is an overcharge calculation for his IAP market, which Dr. Singer refers to as the "In-App Aftermarket model" (hereafter "Singer IAP model").[49] Here, Dr. Singer uses a one-sided theoretical model to predict Google's but-for per-unit service fee for IAPs. Using this but-for per-unit service fee and an assumption regarding the pass-through rate, he calculates overcharges paid by consumers on IAPs. In this calculation, he again assumes that consumer subsidies, as a percentage of the app price, would have been the same in the but-for world as in the actual world.

58.   For the third calculation, Dr. Singer combines downloads and IAP and treats them together, which he refers to as the "single market take rate model" (hereafter "Singer combined market take rate model")[50] He again uses a theoretical two-sided platform model based on Rochet and Tirole (2003) to predict Google's but-for service fee rate for paid downloads and IAPs. Using this but-for service fee rate and an assumption regarding the pass-through rate, he calculates overcharges paid by consumers on paid downloads and IAPs. In this calculation, he again assumes that the

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[47]   Jean-Charles Rochet & Jean Tirole, "Platform Competition in Two-Sided Markets," 1(4) European Economic Association 990 (2003) (hereafter "Rochet and Tirole (2003)").

[48]   Singer Report ¶ 304.

[49]   Singer Report ¶ 330. Dr. Singer provides an estimate of U.S. Consumers' aggregate damages as the summation of his damage estimates from his app distribution market and in-app aftermarket. See Singer Report Table 18. I hereafter refer to this as the "Singer app/in-app model."

[50]   Singer Report ¶ 441.

consumer subsidies, as a percentage of the app price, would have been the same in the but-for world as in the actual world.

59.   For the fourth calculation, Dr. Singer again combines paid downloads and IAPs and applies the theoretical two-sided platform model, which he refers to as the "discount model" (hereafter "Singer combined market discount model").[51] However, for this calculation, he assumes that the service fee rate would have been the same in the but-for world as in the actual world and instead uses the model to predict the but-for consumer subsidy level. He then calculates damages based on the difference between the amount of consumer subsidy in the but-for and actual worlds.

60.   For the fifth calculation, Dr. Singer uses the same theoretical model for paid downloads and IAPs to predict both the service fee rate and the consumer subsidy level in the but-for world, which he refers to as the "single market hybrid model" (hereafter "Singer combined market hybrid model").[52] That is, he allows for the possibility that both could have changed in the but-for world. Damages are the sum of the service fee rate overcharges passed through to consumers and the subsidy reduction in the actual world versus the but-for world. Thus, this calculation is a hybrid overcharge/consumer subsidy calculation.

61.   For the sixth calculation, Dr. Singer calculates damages under the assumption that, in the but-for world, Google would have paid out consumer subsidies in the same percentage of revenue as Amazon has paid out in the Amazon App store on third party devices, which he refers to as the

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[51]   Singer Report ¶ 384.

[52]   Singer Report ¶ 441.

"Singer Amazon discount model."[53] Dr. Singer's sixth calculation is a purely consumer subsidy

calculation.

B.   Dr. Singer's Overcharge Damages Calculations

62.   As noted above, Dr. Singer's first three calculations focus on service fee overcharges and

involve (1) using a theoretical model to determine the but-for service fee rate and then (2) applying

an assumed pass-through rate to determine the amount of the service fee rate overcharge that

consumers paid. Each of these three calculations is flawed because the assumed pass-through rate

is unsupported and, in fact, inconsistent with the empirical evidence and the theoretical model used

to determine the but-for service fee rate is based on inappropriate assumptions.

1.   Dr. Singer's Pass-Through Rate Formula Is Erroneously Based on the Formula for the Per-Unit Cost Rather Than for the *Ad Valorm* Cost

63.   Dr. Singer's pass-through rate is based on his assumed logit demand model, which is

unsupported and flawed, as discussed below. But even taking his logit demand model as given,

as a fundamental matter, Dr. Singer fails to account for the differences between the pass-through

of a service fee rate (assessed as a percentage of revenue) and the pass-through of a traditional

marginal cost and erroneously uses a pass-through rate formula based on the per-unit cost. He

cited one of my publications multiple times to support cost pass-through without understanding

that I was discussing per unit marginal cost instead of the pertinent *ad valorem* cost.[54] In his Class

Rebuttal Report, Dr. Singer further confuses the service fee pass-through and its relationship with

per unit marginal cost when he defends his high pass-through rate by arguing that service fee itself

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[53]   Singer Report ¶ 420.

[54]   Singer Report fn. 790 and 791, citing Jerry Hausman & Greg Leonard, Efficiencies from the Consumer
       Viewpoint, 17(3) GEORGE MASON LAW REVIEW 707, 709 (1999).

is a marginal cost (hence there should be pass-through): "the take rate [service fee rate] itself represents a marginal cost that applies to the initial App purchase and any purchase of In-App Content."[55]

64.   Correcting this mistake alone, even if retaining his logit demand model, shows that the pass-through rate depends on developer's marginal cost, and as discussed above, the pass-through rate for a given change in a service fee rate will decrease with marginal cost.[56] That is, all else equal, if a firm's marginal cost per unit of output is lower, its pass-through rate for a service fee rate change will be smaller.[57]

2. Dr. Singer's Pass-Through Rate Estimate is Effectively an Assumption, Is Unsupported, and Is Inconsistent with the Empirical Evidence

65.   For Dr. Singer's calculations focusing on service fee overcharges, his theoretical models produce a measure of the overcharge that app developers supposedly paid on the Google Play service fee rate, but consumers were damaged only to the extent that the app developers passed at least part of the service fee overcharge through to consumers in the form of higher paid download, IAP, or subscription prices. As discussed above, the pass-through rate for a given firm (here, an app developer) depends on the shape of the demand curves faced by the firm and its competitors, the nature of competition, and other marketplace factors and thus is ultimately an empirical issue. Rather than undertaking an empirical analysis designed to measure the pass-through rate for app developers, Dr. Singer effectively assumes a pass-through rate. This is because *he assumes a*

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[55]   Singer Class Rebuttal Report ¶ 21.

[56]   See Appendix D for details.

[57]   As with many aspects of pass-through, this property depends on the shape of the demand curves. For a specific type of demand curve shape (constant elasticity, as those assumed by Dr. Singer in some of his damages models), the pass-through rate for a service fee rate change does not change with marginal cost.

particular shape for the demand curves faced by app developers. The pass-through rate is essentially dictated given this assumption because, as noted above, the pass-through rate depends on the shape of the demand curve.

66.   I have discussed above why Dr. Singer's formula is wrong even taking his logit demand as given, because it is not based on the *ad valorem*-type service fee at issue. However, there are other ways to see why Dr. Singer's pass-through formula is flawed. Under his assumption (and holding the elasticity of demand constant), Dr. Singer's formula shows that a firm's pass-through rate is determined only by its share of unit sales in a given app category and is inversely related to the unit share.[58] . But because most individual developers have small shares of Android downloads, IAPs, or subscriptions within each app category as defined in Google Play's transactions data, and Dr. Singer (incorrectly) assumes that all apps in each app category are in the same broad "market," Dr. Singer's pass-through rates for individual developers will be near 100% merely as a consequence of Dr. Singer's assumption of the logit demand.[59] This makes no economic sense and does not comport to the economic reality. Dr. Singer tries to defend his use of these broad app-cateogry-based markets. For example, Dr. Singer argues that the "Play Store's categories make economic sense because they reflect economically reasonable groupings of consumer tastes for different varieties of Apps, as recognized by a range of industry participants, including

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[58]   As Dr. Singer explains, "what the logit demand system does imply is that developers in a given category pass through cost savings according to their dominance (or lack thereof) in the category, as measured by their market share within that category." Singer Report ¶ 351.

[59]   Dr. Singer also gives reasons why he believes there should not be any meaningful "classification error" because the categories are self-selected by the developers, see Singer Report ¶ 350 ("Developers, who presumably know their customers best, use Google's categories to sell their Apps in competition with other developers; they have clear incentives to select a meaningful category to maximize the value of their Apps.") While a developer may want to assign its app to the most relevant category, there may still be ambiguity as to which category is in fact the most relevant, given how broad these categories are. I discuss this point further below.

Google."[60] He specifically noted that these App cateogries have been used by Google and industry analysts in consumer research. But the fact that these categories are used by Google and analysts does not justify their validity or relevance for informing the specific economic question of service rate pass-through. Some examples will make clear why Dr. Singer's method leads to non-sensical results. Consider the category Education. This category includes "exam preparations, study-aids, vocabulary, educational games, language learning" and more.[61] It is clear how broad this category is and why using it would significantly inflate Dr. Singer's pass-through rates. According to the transaction data that Dr. Singer used to calculate the shares and pass-through rates, Rosetta Stone, a major developer of language learning apps, is in the same Education category along with an app that identifies plants (PictureThis - Plant Identifier), an app of kids books (Epic: Kids' Books & Reading), and a communication app for teachers, parents, and students (ClassDojo). As a result, Dr. Singer's pass-through rate for Rosetta Stone would depend on a "market" that includes all types of exam preparation, study-aids, children's books, educational games, all regardless of the subject matter or the price level.[62] This makes little economic sense. Consider next the category Business. This category includes "document editor/reader, package tracking, remote desktop, email management, job search."[63] Consequently, a business accounting app such as QuickBooks Online Accounting is in the same "market" as Thumbtack, an app for home improvement service business, Sideline, an app for adding a second phone number, and even Linkedin, a professional

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[60] Singer Report ¶ 349.

[61]   "Choose a Category and Tags For Your App or Game," Play Console Help, https://support.google.com/googleplay/android-developer/answer/9859673 .

[62] The latter implies that Dr. Singer treats an app priced at $0.99 exactly the same as another app priced at $199.

[63] "Choose a Category and Tags For Your App or Game," Play Console Help, https://support.google.com/googleplay/android-developer/answer/9859673.

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network app. The same issue applies to most of the App categories Dr. Singer uses.[64, 65] Another way to see why these App categories are overly broad is to recognize that in the transaction data that Dr. Singer used to calculate the shares, Google Play store has ▮▮▮▮▮▮▮ but only 33 App categories and as Dr. Singer noted "[m]ore than 99 percent of the Apps are assigned to just one category."[66] The combination of a large number of apps, a small number of categories, and the overwhelming fraction of the apps being assigned to a single category has two implications. First, many categories will have to rather encompassing, consistent with what I showed above. Second, some apps that may very well fit in multiple categories were put in only one of the categories. Dr. Singer's pass-through rate for a developer can be drastically different when an app is moved into another sensible category. In fact, Dr. Singer considered putting Tinder in both the Lifestyle category and the Dating category and estimated a pass-through rate of 65.5% for the former and 81.4% for the latter. Dr. Singer does not assess any alternative categories for other Apps.[67] Finally, the developer of the paid app ▮▮▮▮▮▮▮ offers two apps in the music

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[64] For further examples, consider the category Tools, which includes "tools for Android devices," and the category Finance, which includes banking, payment, ATM finders, financial news, insurance, taxes, portfolio/trading, tip calculators. "Choose a Category and Tags For Your App or Game," Play Console Help, https://support.google.com/googleplay/android-developer/answer/9859673. Dr. Singer attempted a sensitivity analysis where he used subcategories of the Game category and reported a 14.7 percentage points reduction in his estimated pass-through rate for the game category.

[65] In his Class Rebuttal Report, Dr. Singer also argues that his approach "yields the economically intuitive result that developers with a lower market share (and thus less pricing power) will be inclined to pass through a larger proportion of a given cost decrease to consumers." This qualitative argument misses the point as Dr. Singer would obtain the same qualitative finding no matter how he defines the App market, as long as he uses the logit demand form and his incorrect pass-through formula. Singer Class Rebuttal Report ¶ 73.

[66] Singer Report ¶ 349.

[67] Instead, Dr. Singer argues that "although there is no requirement that the market share for the logit demand model be computed in a relevant antitrust market, it bears noting that antitrust has recognized 'cluster markets,' in which the market is comprised of items that are not always substitutes." Singer Report ¶ 352. Therefore, Dr. Singer appears to concede that his app category-based "markets" may very well contain apps that are not substitutes for each other. But more fundamentally, a logit model like the one that Dr. Singer used *assumes* that the products over which shares are calculated are substitutes for each other and, even more, that the cross price elasticities of demand are the *same* for all products (with respect to a given product's price). Thus, the logit

and audio category and has an average unit share of 7% of the category.[68] Dr. Singer's approach predicts this developer will have a pass-through of 93% based on its average unit share of 7% in the category. Yet, contrary to Dr. Singer's prediction, the prices of the paid apps (and IAPs) of this developer did not change after the service fee rate change in July 2021. This demonstrates how Dr. Singer's approach to pass-through rates is inconsistent with the empirical evidence.

67.   Assuming a different demand curve shape would have implied a different pass-through rate. For example, a firm with the same elasticity of demand and same market share, but facing a linear demand curve rather than a logit demand curve, can have a substantially different pass-through rate. Had Dr. Singer assumed a different demand curve shape, he would have obtained a different pass-through rate and thus different damages calculations.

68.   Dr. Singer could have either empirically demonstrated that the actual demand curves faced by app developers have the shape that he assumed or he could have performed a direct econometric estimation of the pass-through rate using procedures flexible enough to be valid regardless of the shape of the demand curves. He did neither and thus his pass-through rate assumption is unsupported. While Dr. Singer estimates a logit demand function on app data, this assumes, rather than demonstrates, that the logit functional form is the appropriate demand functional form to use in this context. To make such a demonstration, Dr. Singer would have had to, for example, compare the logit model to alternative demand functional forms to assess which provided a better fit to the app data. Dr. Singer's justification for his logit model appears to be that it "fits the data

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model is not appropriate for modeling a "cluster market." Accordingly, Dr. Singer's approach can lead to non-sensical results.

[68]   The app ▮▮▮▮▮▮▮▮▮▮ also offers IAPs, whose prices stayed the same after the service fee rate decreased from 30% to 15% after July 1, 2021. This developer also offered another paid app ▮▮▮▮▮▮▮▮▮▮ in the music and audio category during February 2015 and November 2016, whose prices stayed flat during this period as well.

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well for the Play Store's various App categories: price coefficients have the expected (negative) sign and are highly statistically significant"[69] and that it "explain[s] approximately 95 percent of the variation in category shares."[70]   However, as a matter of generally accepted econometric methods, this is not a valid justification for his use of the logit model. As a logical matter, because he did not compare the logit model to any alternative demand functional forms to assess which provides a better fit and whether the logit model is the only demand model that produces what he claims are the expected sign and statistical significance, he has no empirical basis by which to claim that the logit model is the one to use.

69.   But the most fundamental issue with Dr. Singer's justification is that it violates basic statistical principles. Consider Dr. Singer's justification based on how much data variation the logit demand model explains. First, the variation he referred to is the variation in his "dependent variable," developer category shares, which is dictated by his assumption of demand functional form. Therefore, being able to explain the variation of a variable which itself is an implication of his assumption cannot be used to defend his assumption. Had he considered different demand shapes that imply a different dependent variable, then the percentage of variation explained, commonly known as a regression R-squared (R^2), would not even be comparable. This is a well-known statistical principle.[71]

70.   Furthermore, even if the dependent variable is the same, statisticians and econometricians have cautioned against the use of percentage of explained variation for choosing among model

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[69]   Singer Class Rebuttal Report ¶ 70.

[70]   Singer Report ¶ 354.

[71]   See, for example, Peter Kennedy, A Guide to Econometrics, 6th Edition, 2011, p 103 ("... if the dependent variables are not the same, the R^2 is not directly comparable.").

specifications.   In fact, one can always increase the R-squared by putting more explanatory variables into the statistical model and/or by making the model more flexible, irrespective of whether the additional factors or model flexibility reflect the true underlying relationship.[72] Using the percentage of variation explained can lead to the statistical issue of overfitting. For example, in the context of choosing flexible statistical models, econometrician Peter Kennedy explains that one needs to be careful to avoid "the very real danger of overfitting," which is when the model matches the data so well that it "reflects peculiarities of this dataset rather than the general underlying specification."[73]

71.   Nor is statistical significance of the explanatory variables a valid justification for the demand functional form. Dr. Singer's own actions demonstrate that he understands this. His OLS regressions also give statistical significance (and his expected signs) and yet he did not stop there. He also uses "'IV' regressions to correct for endogeneity."[74] Clearly, he recognizes that "correct" signs and statistical significance do not, by themselves, mean that the underlying estimates are valid.

72.   Dr. Singer also tries to justify his logit demand form by arguing that it is "standard."[75] He cites to some literature to support this justification. While the logit demand form has been used in economics historically, economists have uncovered a number of serious limitations in the simple logit model used here by Dr. Singer to the point where today it is uncommon for an empirical

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[72] See, for example, James Stock and Mark Watson, Introduction to Econometrics, 6th edition, 2014, p. 197 and Jeffrey Wooldridge, Introductory Econometrics, 2016, p. 180.

[73] Peter Kennedy, A Guide to Econometrics, 6th Edition, 2011, p. 357.

[74] Singer Report ¶ 353.

[75] See Singer Class Rebuttal Report ¶ 70 and also ¶ 74 (arguing that one should not fault the simple pass-through formula based on logit demand).

economics research study to use this model, at least without substantial testing of whether its limitations are restrictive in the context where it is being used.[76] Thus, "it has been used in the past" is not a valid justification for Dr. Singer's use of the logit model here, particularly given the substantial sensitivity Dr. Singer's damages calculations have to this choice. In fact, Eeconomists have concluded that the logit model is highly restrictive and therefore not a good modeling choice in many contexts.

73.   The only support for his pass-through rate assumption that Dr. Singer identifies are two observations about pricing in the marketplace.[77] First, he notes that subscriptions for six particular apps (Tinder, BookedIn, Down Dog, Spotify, Tidal, and YouTube) are priced differently on their websites than within their respective Android apps. Based on the price differences between the website and within-app, Dr. Singer computes "implied pass-through rate[s] [sic]," which he claims

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[76] The logit model (and the CES demand model used by Dr. Rsyman) exhibits what is called the "independence of irrelevant alternatives" (IIA) property. The IIA property places strong restrictions on substitution patterns between products (i.e., the own- and cross-price elasticities of demand). Because of IIA's restrictiveness regarding substitution patterns, from the early 1980s, the economics literature has warned about the use of the logit model of demand. See, e.g., D. McFadden, "Econometric Models of Probabilistic Choice," in *Structural Analysis of Discrete Data with Econometric Applications*, 1981, pp. 222-223 ("…models satisfying [IIA] yield implausible conclusions when there are strong contrasts in the similarity of the alternatives"); S. Berry, "Estimating Discrete Choice Models of Product Differentiation," *RAND Journal of Economics*, 1994, p. 250 ("[t]he logit model products unreasonable substitution patterns"); J. Hausman and G. Leonard, "Economic Analysis of Differentiated Products Mergers Using Real World Data," *George Mason Law Review*, 1997, p. 322 ("…the [IIA] assumption…implicitly restricts the demand structure by constraining the pattern of demand substitution between products"); D. Brownstone and K. Train, "Forecasting New Product Penetration with Flexible Substitution Patterns," *Journal of Econometrics*, 1999, p. 110 ("…identification of the correct substitution patterns is an empirical issue, and the IIA property…imposes a particular substitution pattern rather than allowing the data analysis to find and reflect whatever substitution pattern actually occurs"); A. Nevo, "Mergers with Differentiated Products: The Case of the Ready-to-Eat Cereal Industry," *RAND Journal of Economics*, 2000, p. 402 ("the logit model greatly restricts the own- and cross-price elasticities"); P. Davis and E. Garces, *Quantitative Techniques for Competition and Antitrust Analysis*, 2010, pp. 477-478 ("…the logit model imposes severe limitations on own- and cross-price elasticities…we recommend strongly against using [logit] models in situations where we must learn something about substitution patterns…"). As a consequence, economists have developed less restrictive demand systems (e.g., S. Berry, et al., "Automobile Prices in Market Equilibrium," Econometrica, 63 (1995), pp. 841-890) and these systems are the most commonly used in empirical economics research today.

[77] Singer Report §VI.D.4.V.

range from 33% to 105%.[78] He concludes that this range supports his 91.1% assumed pass-through rate for all Android apps.

74.   However, Dr. Singer's website versus within-app price comparison using these six apps is a flawed method by which to derive a pass-through rate that would then be assumed to apply to all Android apps for several reasons.

75.   First, Dr. Singer cherry-picked the six examples and ignored that there are many other cases where the website price is the same as the within-app price. For example, the Minecraft game is listed at the same price on Google Play and on the developer's website.[79] A subscription to iHeartMedia has the same retail price on Google Play and the website.[80] A subscription to Pandora Plus has the same retail price on Google Play and the website.[81] In fact, Tinder charges the same price in-app, regardless of whether a consumer pays using Google Play Billing or Tinder's own billing system.[82] ██

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██[83] In his Class Rebuttal Report, Dr. Singer tried to dismiss examples of apps that charge the same prices on websites and in app. In his view, the pricing of those apps is uninformative about pass-through

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[78] Singer Report Table 14.

[79] The Minecraft app's price is $7.49 for Android mobile version on the developer's website https://www.minecraft net/en-us/store/minecraft-android,, as well as in the Google Play store, https://play.google.com/store/apps/details?id=com.mojang minecraftpe.

[80] https://www.iheart.com/offers/, accessed November 4, 2022. Google Play store price accessed with an Android device as of November 4, 2022.

[81] https://www.pandora.com/plans, accessed November 4, 2022. Google Play store price accessed with an Android device as of November 4, 2022.

[82] See screenshots from Tinder mobile application downloaded from Google Play.

[83] Czeslawski Deposition, p. 285: 5-24.

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because Google's "anti-steering restrictions … explicitly prevent developers from directing customers inside the Play Store to lower-cost options outside the Play Store. An App that charges the same price within the Play Store and on its website has simply not adopted a steering strategy in the actual world."[84]   Note that Dr. Singer is not denying the fact that a developer is free to set different prices in app and on websites; he also acknowledges that some apps do charge the same prices. Instead, he claims that only the evidence that supports his conclusion is relevant and informative. When the evidence does not support his conclusion of high pass-through, he argues that that is simply because the developers have not done it yet; however, this is pure speculation for which he provides no actual evidence. This is another example where Dr. Singer assumes his conclusions.

76.   Second, the six apps Dr. Singer chose to examine do not constitute a representative sample of all Android apps. Three of the six apps, Spotify, Tidal, and YouTube, are music and video streaming apps. Such apps have significant marginal costs, as they are obligated to pay royalties to content providers such as record labels and music publishers. In contrast, many other types of apps do not require the payment of royalties and, indeed, as discussed elsewhere in this report the marginal cost for many other types of apps would be expected to low. As explained above, the pass-through rate for a service fee can vary with marginal cost. Thus, apps with high marginal costs like certain streaming apps will not be representative of those apps that have low marginal costs for the purposes of determining the service fee pass-through rate.[85]   No valid conclusions for the large majority of Android apps can be made based on music and video streaming apps. Like

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[84]   Singer Class Rebuttal Report ¶ 80.

[85]   Even for streaming apps, such as music streaming apps, some copyright royalties are *ad valorem*.

the streaming apps, Down Dog, a yoga and exercise app, also likely has significant marginal costs due to having to pay fees to instructors when new members sign up.

77.   Third, Dr. Singer's implicit assumption that the *entire* difference between the website price and the within-app price for these six apps is due to the service fee rate that is paid on the latter is invalid. Basic economics teaches that prices are determined by both supply and demand. Price differences, therefore, could be caused by differences in supply factors (e.g., costs, service fee rate, complementarities between products, etc.) demand factors (e.g., the characteristics and options of consumers who purchase, respectively, on the website or in-app), or both. Attributing the entire price difference to the difference in service fee alone, as Dr. Singer did, is incorrect, unless Dr. Singer could establish that none of the other economic factors differ between the website and in-app. Dr. Singer made no effort to show that the price differences are driven entirely by the single supply-side factor he identified–the service fee rate–and not driven at all by any other supply-side factors (costs, complementarities between products, etc.) or demand-side factors (e.g., the characteristics and options of consumers who purchase, respectively, on the website or in-app).

78.   In fact, there are good reasons to believe that other economic factors could contribute to the price difference. On the supply side, the lower price on an app's website may due to other strategic considerations. For example, Epic reduced the price of V-Bucks as part of its Project Liberty project, ███

███████████████[86] It could also be the case that developers may not consider their costs and app

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[86] See EPIC_GOOGLE_03979041. The Court's decision in *Epic v. Apple* states that "Project Liberty included a public narrative and marketing plan" and cites Epic's own characterization of the price drop of V-Bucks as a public relationship strategy: "Project Liberty included a public narrative and marketing plan. Epic Games recognized that it was 'not sympathetic' and that if Apple and Google blocked consumers from accessing the app, '[s]entiment will trend negative towards Epic." "[T]he critical dependency on going live with our VBUCKS

store service fee payments when setting prices. For example, ███████████████

██ [87] ███████████

███ [88]

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████ . [89]

79.   Again, Dr. Singer's assumption that any price difference between the website and in-app

is entirely due to the Google Play service fee, and not at all due to any other supply or demand

factor is untenable. Another way to frame the issue is that Dr. Singer's approach suffers the well-

known omitted variable bias. My empirical analysis of pass-through, as discussed above, shows

that bias in Dr. Singer's approach is substantial. In contrast to Dr. Singer's assumed 91.1% pass-

through rate, I find a pass-through rate of no more than 3%.

80.   Dr. Singer then argues that "Google's take rate is economically analogous to a tax on

developers. Elementary economics shows that changes in tax rates shift prices, including the

prices paid by consumers for goods or services subject to sales taxes. … When a digital product is

subject to a tax, this burden is typically passed through in full to the customer; it is not absorbed

by the seller."[90] As a piece of supporting evidence, Dr. Singer estimates a regression model where

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price reduction efforts is finding the most effective way to get Apple and Google to reconsider without us
looking like the baddies.'" *Epic Games, Inc. v. Apple Inc.*, Rule 52 Order After Trial On The Merits, NO. 4:20-
CV-05640-YGR (N.D. CAL.).

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[88] ██

[89] █████████████████████████████████████

[90] Singer Report ¶ 367.

he essentially correlates post-tax prices and the tax rates across states and time and claims that the estimated coefficient on the tax rate implies 100% pass-through.[91]

81.   However, Dr. Singer's arguments are flawed, and his regression analysis is uninformative about the pass-through of service fees. First, while the service fees are levied directly on the developers, sales taxes are levied directly on consumers. Therefore, for Dr. Singer's argument that it is the developers' *decision* to pass on the full amount of taxes to make sense, it must be the case that developers have the *ability* to adjust *pre-tax* prices in response to tax rate variation as a way to absorb taxes, but *choose* not to. If developers do not have the ability to adjust pre-tax prices in response to tax rate variation, or otherwise choose prices independently of tax rates, Dr. Singer cannot equate the changes in prices due to taxes to the changes in prices due to service fees. Google Play, as Dr. Singer noted, offers the service of calculating appropriate taxes and automatically applies the calculated amount to the final price that a consumer pays in the US.[92] I understand that Google's system does not allow developers to systematically set different pre-tax prices for different states in the US.[93] However, tax variation across states is the only source of cross-sectional variation that Dr. Singer considered in his regression model. Indeed, for most developers, given the global nature of the Google Play store, having to deal with the complexity and intricacies of state and local tax laws and needing to figure out the appropriate amount of taxes

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[91]   Singer Report ¶ 368.

[92]   Singer Report, fn. 873. See also Tax rates and value-added tax (VAT) – Play Console Help, support.google.com/googleplay/android-developer/answer/138000?hl=en ("In accordance with sales tax requirements, Google is responsible for determining, charging, and remitting sales tax for Google Play Store App and in-App purchases by customers in these states. Google will collect and remit sales tax to the appropriate tax authority, as applicable. You don't need to calculate and send sales tax separately for customers in these states. Even if you're not located in the United States, this treatment will still apply.")

[93]   Developers can only set the pre-tax list price at country/region level. See, "Set Up Your App's Prices," Play Console Help, https://support.google.com/googleplay/android-developer/answer/6334373?hl=en#zippy=%2Cpaid-apps%2Cin-app-items%2Csubscriptions, accessed Oct 28, 2022.

to charge would be costly, even if they *could* set different prices. In short, because developers do not have the ability to change different pre-tax prices in response to different tax rates across states at a given point in time, Dr. Singer has no basis to claim that his tax regression is informative about developers' *decision* to pass on taxes.

82.   Thus, Dr. Singer's regression of post-tax prices on tax rates is also uninformative about service fee pass-through. His regression coefficient for the tax rate is approximately 0.01, which Dr. Singer interprets as a 100% tax pass-through. He explains in a footnote, "suppose that the price of an App is initially $2.00. The regression predicts that, if the tax rate increases by one percentage point, the [post-tax] price that the consumer pays for the App will increase by approximately 1.1 percent, from $2.00 to $2.02."[94] However, when the pre-tax prices for individual transactions are set independently from taxes, so that by definition there is zero pass-through, Dr. Singer's regression is *mathematically guaranteed* to produce his finding of a positive and nontrivial coefficient on the tax rate that is close to 0.01. To see this, note that his dependent variable can be written as $\log(P^{pretax} + tax)$.   Using a well-known mathematical approximation,[95] it is easy to show that Dr. Singer's post-tax price is approximately equal to $\log(P^{pretax}) + tax\ rate$, where $tax\ rate = \frac{tax}{ppretax}$. Note also that Dr. Singer's tax variable is equal to multiplied by 100. Basic regression theory tells us that the regression coefficient on this tax variable will have to be close to $\frac{1}{100} = 0.01$. In other words, Dr. Singer's regression essentially correlates tax rate with itself and the 0.01 coefficient is a simple result of the fact that he scaled the tax rate, his independent variable, by 100. Therefore, Dr. Singer's dependent and independent

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[94]   Singer Report fn. 876.

[95]   This is known as a "Taylor expansion." See, for example, Theorem 30.6 of C. Simon and L. Blume, *Mathematics for Economists*, 1994, p. 829.

variables would be guaranteed to be correlated and result in a coefficient close to 0.01, even if developers do not take tax rates into account when choosing their pre-tax prices. That is, Dr. Singer would have gotten the same result whether or not developers take into account tax rates when setting pre-tax prices. Consequently, Dr. Singer's regressions cannot even provide any economically meaningful information about pass-on of taxes, much less the pass-on of a service fee.[96]

83.   Dr. Singer then argues that one cannot rely on the empirical analysis of actual rate changes to infer pass-through. He offers two reasons. One has to do with his claim that that price stickiness, "which arises due to well-understood behavioral economic phenomena such as consumer anchoring, tend to limit pass-through in the actual world, ..."[97] I have addressed this point and explained why this is not a valid argument above. Therefore, I focus on Dr. Singer's second argument. Dr. Singer claims that in "the but-for world with more than one App store or payment processor, developers would be incentivized to pass on savings from a lower take rate via steering and discounting, to induce consumers to switch to the low-cost provider... These incentives are absent in the actual world. Developers that enjoyed Google's limited take-rate decreases in the actual world did not have to share any of the savings with their customers in order to realize the cost savings." Dr. Singer's claim that being able to steer consumers is the main or even the *only* reason developers pass on cost savings is wrong as a matter of basic economics and is directly contradicted by his own models and calculations. Nowhere in any of his theoretical models does he incorporate steering by developers, yet he has built pass-through into the models regardless.

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[96]   In his implementation of the regression models, Dr. Singer also made a mistake when he constructed his post-tax prices. Dr. Singer mistakenly divided the unit tax by the quantity sold. This means that the taxes included in his post-tax prices are artificially deflated.

[97]   Singer Report ¶ 370. Internal citations omitted.

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Moreover, the logit-based pass-through formula Dr. Singer used to infer his high pass-through rates does not reflect or depend on steering whatsoever. Dr. Rysman's assumed model, which I respond to in detail in the next section, also does not incorporate steering and yet implies 100% pass-through. In other words, while Dr. Rysman does not provide any empirical support for his assumed 100% pass-through rate, his model nevertheless shows that pass-through may exist absent "steering," contrary to Dr. Singer's claim. In addition, even as a theoretical matter, Dr. Singer cannot assume that Google would be necessarily induced to lower prices simply due to developers' potential steering in the but-for world. Branded drug pricing after generic entry is a prominent example where entry does not necessarily result in lower prices for incumbents, even in the presence of steering.[98] The explanation is that generic drugs may attract "price-sensitive" consumers, i.e., those with high price elasticity, which in turn implies that those who continue to use branded drugs are less price sensitive. A rational branded drug producer may therefore choose to maintain or even raise its price after generic entry. Google may face similar incentives in the but-for world--price-sensitive consumers could switch to other stores, leaving less price-sensitive consumers ("single homers") on Play. Accordingly, Google may have chosen to maintain its service fee rather than respond to the entry of other app stores.[99] Dr. Singer claims but never analyzes the number or identity of any app stores entering in the but-for world, so his speculation about steering and its effects is just that. In addition, if developers have a strong incentive to steer consumers, as Dr. Singer claims, developers prevented from steering within the Google Play store

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[98]   D. Lakdawalla, "Economics of the Pharmaceutical Industry," *Journal of Economics Literature*, 56 (2018). Pharmacies often have the economic incentive to steer patients toward generic versions of a drug given that they receive larger profit margins on generic than branded drugs.

[99]   In Section VIII, I discuss in more detail the economic reasons why consumers may single-home and why Google could maintain its service fee rate in the but-for world, in the context of higher but-for costs.

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would find ways to steer through other means. For example, nothing prevents a developer advertising lower prices outside Google Play, reaching users through social media or online forums, or turning its app into a "consumption-only" app.[100] Even assuming Dr. Singer's theory is correct, to say that "these incentives are absent in the actual world" is not accurate. Ultimately, this is an empirical question and Dr. Singer provided no evidence to support his hypothesis.

84.   In fact, empirical observations from South Korea show that Google did not change its service fee rate when rival platform ONE Store entered and that developers do not tend to offer lower-priced apps on ONE Store, even though ONE Store offers a lower service fee. Among the top 50 paid apps in ONE Store, 31 apps are also available in Google Play, among which 18 apps (58%) offer the same price in both app stores, 8 apps (26%) offer a higher price in ONE Store, and only 5 apps (16%) offer a lower price in ONE Store. That is, 84% of these top apps are either priced the same or higher in ONE Store. See Figure 7. In other words, despite Dr. Singer's recognition that with ONE Store, "developers can now (setting aside any restrictions by Google) steer their customers to the lower-cost platform via discounting prices to consumers for Apps," vast majority of these top apps do not do so.[101] While Dr. Singer claims that there may be other "restrictions by Google," none of the alleged restrictions prevents a developer from setting a different price in the ONE Store. As discussed above, if developers have a strong incentive to steer consumers, they would set a lower price in the ONE store and steer through other means (e.g., word of mouth or other forms of publicity such as digital advertising outside Google Play).

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[100] As Dr. Rysman explains, "some developers, such as Amazon, Netflix, and Tidal, decided to make their Android apps 'consumption-only,' meaning that digital content may be purchased outside the app (such as on the web) to be used in the app. The result is that consumers cannot buy in-app what they could before, like Kindle books or movie streaming." Rysman Report ¶ 508.

[101] Singer Report ¶ 309.

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Figure 7.   Prices of Top Paid Apps in ONE Store vs. Google Play in South Korea

App Name	App Price	
	ONE Store	Google Play
The Cloud Dream of the Nine M	33,000 Won	33,000 Won
Dead Cells	21,000 Won	12,000 Won / In App Purchase
Some Some Store: Love Convenience Store	15,000 Won	15,000 Won
Miracle snack shop	14,000 Won	14,000 Won
Wonder Boy: The Dragon's Trap	10,000 Won	12,000 Won
Dawn of Flower	15,000 Won	In App Purchase
When you wish upon a star	7,000 Won	7,000 Won
Knight Run: Homecoming	11,000 Won	11,000 Won
Love Flute	10,000 Won	10,000 Won
White day: A labyrinth named school	8,800 Won	8,900 Won
Lu Bu Maker	8,000 Won	8,000 Won
DragonSpear-EX	5,900 Won	5,900 Won
She is Mermaid	5,000 Won	5,000 Won
Some Some Convenience Store / Soohee After Story	5,000 Won	5,000 Won
Istelia Story	2,300 Won	2,300 Won
Persephone	4,000 Won	6,500 Won
Shin Hayarigami - Blind man	3,300 Won	3,300 Won
Inbento	3,000 Won	2,300 Won
Cut the Rope: Time Travel	3,000 Won	Free / In App Purchase
Sweatshop Diary DX	3,000 Won	Free / In App Purchase
Memorize Season 4	3,000 Won	3,000 Won
My future girlfriend greeted me	3,000 Won	3,000 Won
Dungeon Warfare	2,900 Won	3,300 Won
The Pleiades of Dreaming Starlight	2,900 Won	2,900 Won
Shin Hayarigami - Doll	2,200 Won	2,200 Won
Decalcomanie	2,000 Won	2,500 Won
Go Stop Puzzle2	1,999 Won	Free / In App Purchase
Dead End 99	1,900 Won	1,900 Won
Hero Rescue Girl: Pin Puzzle	1,000 Won	Free
Cobra Strike	1,000 Won	999 Won
Naval Warfare Korea vs Japan	1,000 Won	1,000 Won

Source: Exhibit 6.

85.   Dr. Singer's damages calculation is highly sensitive to his assumed large pass-through rate. I have replaced Dr. Singer's unsupported pass-through rate assumption with the pass-through estimate I obtained from my empirical analysis and then re-run Dr. Singer's overcharge damages calculations. The result is to decrease Dr. Singer's three overcharge damages calculations by over 95%. See Figure 8.

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Figure 8.   Percentage Change in Consumer Class Damages based on Dr. Singer's Damages Models with Empirical Pass-Through Rate Estimate of 3%
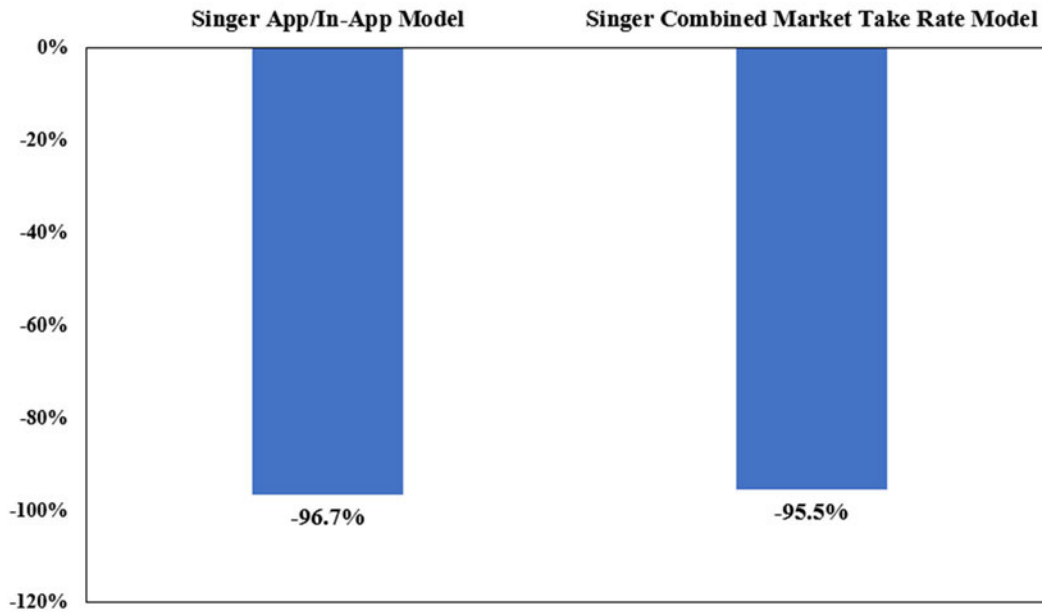
Source: See Exhibit 7a.

3.   The Theoretical Models Dr. Singer Uses to Determine the But-For Google Play Service Fee Rate Are Flawed and Unsupported

86.   As noted above, the first step in Dr. Singer's overcharge damages calculations is to determine the but-for Google Play service fee rate. He does this for each of his "markets" (downloads, IAP, or combined downloads/IAP) using a theoretical model, having made particular assumptions about certain parameters of the model. However, the theoretical models are a poor description of the real-world marketplace and Dr. Singer's assumptions regarding the parameters of the models are unsupported and, in some cases, make no economic sense. Thus, Dr. Singer's theoretical models do not provide an economically valid means of determining the but-for Google Play service fee rate.

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a. Dr. Singer's Assumptions About Model Parameters Are Unsupported or Flawed

87.   Economic models typically require that values be chosen for model "parameters" in order to produce quantitative results. Even if a model is a good fit for an industry, the model will produce flawed results if incorrect values of the model parameters are chosen. Here, Dr. Singer has chosen to use inputs and assumptions that are unsupported or flawed. Even taking his modeling framework as given, economically plausible changes to the value of even a single such input can have a large impact on overcharge damages that Dr. Singer's theoretical models produce.

88.   **Google Play's Actual Market Share.** Google Play's actual market share is an input to Dr. Singer's theoretical models. For the purposes of my report, I take Dr. Singer's market definitions as given. In his download (app distribution) model, Dr. Singer assumes that Google Play's actual market share is 100%.[102] In his IAP model, Dr. Singer assumes that Google Play's actual market share is 97%, based on the percentage of developers (not weighted by developer revenue) that sell digital products (paid downloads, IAP, and subscriptions) on Google Play *and* comply with the Google Play Billing policies (i.e., use Google Play Billing).[103] These assumptions regarding Google Play's actual market share are flawed and unsupported for the following reasons.

89.   First, the assumption for actual market share should simply be based on Google Play's actual share of the transactions in question (e.g., Android app paid downloads and IAP in the case of Dr. Singer's combined downloads/IAP model). Google Play faces competition from other Android app stores (e.g., Samsung Galaxy Store and Aptoide) and other app distribution channels

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[102] Singer Report fn. 686. Dr. Singer directly used Google Play's actual world firm-specific consumer product price elasticity as the actual world market-wide consumer product price elasticity, which implies a 100% actual world share for Google Play in the claimed market.

[103] Singer Report fn. 748.

on Android (e.g., sideloading). Dr. Singer himself provides data on Google Play's actual market share that account for these forms of competition. These data show that Google Play's share of downloads/IAP is well below the 100% that Dr. Singer assumes. For example, Dr. Singer claims that "[d]ata from industry analysts on mobile app expenditures (which aggregates consumer expenditures on both initial downloads and in-App purchases) confirm … that the Play Store alone accounts for the vast majority of mobile app expenditures outside China and distinct from iOS… the Play Store accounted for 85.9 percent of non-Apple mobile app expenditures outside of China in 2018."[104]

90.   For the IAP model, Dr. Singer uses the share of developers (unweighted by revenues) who comply with Google's Payments Policy among those who sell digital products (paid downloads, IAP, and subscriptions) on Google Play to obtain the 97% market share.[105] However, developers who do not comply are likely to be larger developers that have their own payment processing tools, such as Spotify, Epic, and Match. Therefore, Dr. Singer's failure to weight developer counts by developer revenues means that Google Play's share of developer revenues is likely to be substantially lower than its share of developers (i.e., the 97% that Dr. Singer assumes is Google Play's actual market share in IAP).[106] In fact, Dr. Rysman provides estimates of Google Play Billing's revenue-based share in the "IAP billing services market," which show a decrease from ▮▮▮▮ in 2017 to ▮▮▮▮ in 2021.[107]

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[104] Singer Report ¶ 122. I do not offer an opinion as to whether these figures are accurate.

[105] Singer Report Table 8.

[106] See Burtis Report ¶ 78. "In 2021, the top 10 putative developer class parents accounted for ▮▮▮▮▮▮ of all putative developer class members' consumer spend, and the top 30 developer parents accounted for ▮▮▮▮ ▮▮▮▮▮▮ of consumer spend."

[107] Rysman Report ¶¶ 354 – 355 and Exhibit 52. The weighted average share based on Dr. Rysman's estimates is 86.7%. I do not offer an opinion as to whether these figures are accurate.

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91.   **Google Play's But-For Market Share.**   Another key input to Dr. Singer's theoretical models is Google Play's share in the but-for world. The difference between the assumed actual share and assumed but-for share is an important driver of the "overcharge" in service fee rate that the theoretical model generates. Dr. Singer assumes that Google Play's but-for share would have been 60%. He bases this assumption on the experience of AT&T's long-distance wireline telephone service in the early 1980s following entry by competing services such as MCI and Sprint. As a result of the entry of these competitors, AT&T's share of the total minutes of long distance phone calls decreased from its pre-1982 level of nearly 100% to 60% in 1993, over a ten year period.[108]

92.   Dr. Singer's use of AT&T long distance wireline telephone service for consumers in the 1980s as a "benchmark" for Google Play's services for smartphone app developers in the current day is entirely invalid as a matter of economics. In order for AT&T to be a reliable benchmark for Google's but-for world market share, Dr. Singer must demonstrate that the long-distance wireline telephone service market in the 1980s is economically similar to Android app distribution and IAP services today. However, Dr. Singer has done absolutely nothing to make such a showing. In fact, long-distance wireline telephone service bears no identifiable resemblance to either app distribution or IAP.

- These services are of an entirely different nature provided to different types of customers. Long distance service allowed a person to call another person on a landline phone; the paying customer was the caller who initiated the call, either a consumer or a business. App distribution and IAP are about the distribution of a

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[108] Singer Report ¶ 328, fn. 686; Kahai et al. (1996) p. 502. Interestingly, during the 1982-1984 period, AT&T decreased its long distance prices by only about 6-12% and on a gradual, rather than sharp, basis. See Federal Communications Commission, "Reference Book of Rates, Price Indices, and Expenditures for Telephone Service," June 1999. This contrasts to the large (50%) and immediate price decreases that Dr. Singer assumes Google would have implemented in the but-for world in this case.

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developer's apps to smartphone users and handling in-app purchases by smartphone users. The paying customers are the app developers and the consumer in the app distribution market, and the app developer in the IAP market.

- The technologies used are largely unrelated and thus there is no reason to believe the cost structures are similar, either for the incumbents or for the potential entrants. AT&T and its competitors provided long distance phone service on their respective proprietary landline telephone networks. Google and other app stores provide services to app developers and using a type of computing infrastructure that did not even exist in the 1980s.

- Long-distance wireline telephone service was one-sided with some direct network effect, while app distribution services are two-sided with indirect network effects and potentially some direct network effects.

- The providers are entirely different entities (AT&T, MCI, and Sprint versus Google, Samsung, etc.) with different incentives.

- The change in the market landscape that led to entry in the case of AT&T (AT&T being required to connect long distance calls carried by competitors given that AT&T still had a monopoly in local exchange at that time[109] was different than the change in market landscape that allegedly would have occurred in the but-for world in this case (a relaxing of certain Google Play policies).

93.   Dr. Singer then uses Alcoa as another benchmark to argue that even the 60% market share is conservative. Dr. Singer cites an academic article that estimates "Alcoa's capacity-based market share, on average, is 35%."[110] Alcoa is even more remote than AT&T in terms of being a reasonable benchmark for Google Play. First, as the title of the article Dr. Singer cited indicates, Alcoa is a producer of "a homogeneous product." Competition in a homogeneous commodity market takes place more on prices and less on other attributes of the product. Production capacity, both the industry total capacity and how that capacity is distributed across producers, is an

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[109] See https://www.investopedia.com/terms/b/babybells.asp: "Although [the Baby Bells] had monopolies over local phone service in their respective areas, long-distance phone service opened up to the competition."

[110] Sheng-Ping Yang, Identifying a dominant firm's market power among sellers of a homogenous product: an application to Alcoa, Applied Economics, 34:11, 1411-1419.

important determinant of marketplace outcomes. Notably, the Alcoa share provided by the article

Dr. Singer cites is based on production capacity. In contrast, Google Play and other competing

App stores are not selling a homogenous product and they do not have any production plants.

Moreover, commodity markets like aluminum are one-sided, not two-sided like the the Google

Play platform. There are no direct or indirect network effects in the aluminum market of the types

that are present with two-sided platforms such as Google Play store. In short, the important aspects

of competition that shape market outcomes are entirely different for a one-sided homogeneous

commodity producer with a certain amount of production capacity than for a two-sided platform

offering differentiated services with network effects and no production capacity.

94.   In his class certification Rebuttal Report, Dr. Singer further argues that three additional

"benchmarks" also show his assumption of 60% market share is conservative. These are Netflix,

IBM, and Microsoft Internet Explorer. Specifically, regarding Netflix, he notes that "as recently

as 2014, approximately nine out of every ten SVOD households were Netflix subscribers," but "as

of Q4 2021, Netflix had a streaming share of just 25 percent, compared to Amazon Prime's 19

percent, Disney + and Hulu at 13 percent each, and HBO Max at 12 percent."[111] Regarding IBM,

he argues that "competition from other PC makers such as Compaq and Apple Computer dissipated

IBM's market share, which fell from 80 percent to 20 percent in the decade between 1982 and

1992."[112] Finally, he notes that "In 2004, Internet Explorer enjoyed 95 percent market share....

Recently, Google Chrome has supplanted Microsoft's browser offering (now called Edge) at the

top of the market, with a usage share of 65 percent of of all browsers, compared to 19 percent for

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[111] Singer Class Rebuttal Report ¶ 91.

[112] Singer Class Rebuttal Report ¶ 92.

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Safari and only 4 percent for Edge."[113] These claimed benchmarks suffer the same types of flaws as AT&T and Alcoa that I discussed above. For example, the PC market in which IBM participated was a standard one-sided market. Similarly, the size of any direct or indirect network effects for Netflix and competing streaming services is not clear. Internet Explorer and competing browsers that Dr. Singer cited are portals to the open worldwide web. An open website publisher does not need to ever *choose* to be on one of the browsers. Consumers can visit sites using any internet browser. The Internet browers that Dr. Singer cited are also free and do not charge either consumers or publishers for the use and therefore operate a different type of service than the Google Play store. Dr. Singer's benchmarks range from a long-distance telephone service provider to an aluminum producer, while ignoring the nature of competition and competitive dynamics that are essential to Google Play store.

95.   In asserting that the but-for Google Play share would have been only 60%, Dr. Singer claims that having "app stores side-by-side on their [users'] mobile phone's home screens … can lead to competitive outcomes that benefit both buyers and sellers."[114] However, the real-world example of the Samsung Galaxy Store shows the opposite. Although the Samsung Galaxy Store is pre-installed on nearly all Samsung devices, which present Samsung device users at least two app stores "side-by-side on their mobile phone's home screens," Samsung Galaxy Store's share of consumer spend relative to the total consumer spend from the Google Play and Samsung Galaxy Store on Samsung devices remained low; for example, it was below ███ during the period of January 2018 to October 2020, based on the U.S. market consumer spend data for Google Play

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[113] Singer Class Rebuttal Report ¶ 93.

[114] Singer Report ¶ 283.

and Samsung Galaxy Store among Samsung devices.[115] This suggests that even with the presence

of competing app store(s) in the but-for world, Google Play may still have been able to retain a

high market share.

96.   Dr. Singer has argued that while "Samsung's Galaxy Store is preinstalled on all Samsung

Android devices, …, Samsung's Galaxy Store has not provided effective competition for the Play

Store, …, in part due to Google's conduct, the Galaxy Store has not gained widespread traction

with developers."[116] Therefore, Dr. Singer may respond to Google Play's large share on Samsung

devices by arguing that it was caused by Google's alleged anticompetitive conduct. However, the

qualitative evidence Dr. Singer presented cannot show that Samsung would have had a

significantly larger share in the but-for world. For example, Dr. Singer reports that only eight of

the top 20 most-downloaded Play Store apps were available in the Galaxy Store. But Dr. Singer

presented no evidence that the Galaxy Store would have more such apps in the but-for world. Nor

does he explain how Google's alleged conduct caused some apps not to be on the Galaxy Store,

but not others. At the same time, Dr. Singer ignores the apps that are exclusive to the Galaxy

Store.[117] In fact, it is possible that, in the but-for world, not every app would have been in every

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[115] See Exhibit 14.

[116] Singer Report ¶133.

[117] The Samsung Galaxy Store offers exclusive apps "made for Samsung" that are not available in Google Play, such as Tubi for Samsung, Touch of Modern for Samsung, Good Lock, and Samsung Sans.

app store. Competition may very well have resulted in both multi-homing and single-homing apps
and developers.[118,119]

97.   Dr. Singer's overcharge damages are thus highly sensitive to his assumptions regarding the
actual and but-for Google Play market shares. I show in Figure 9 below the consumer overcharge
damages produced by Dr. Singer's combined market take rate model, using alternative values for
Google Play's actual and but-for market shares while keeping the remainder of the model
unchanged.[120] As the graph shows, the closer Google Play's assumed but-for market share is to
its assumed actual market share, the smaller the service fee rate overcharge generated by Dr.
Singer's theoretical model and thus the smaller the overcharge damages are calculated to be.[121]
For example, even taking Dr. Singer's inflated actual market share assumption of 97% as given,
merely changing the assumed but-for share from 60% to 75% reduces Dr. Singer's damages by
40.9%. Similarly, if the actual market share is assumed to be 85%, rather than 100%, the damages
would be reduced by 24.6% even if Dr. Singer's 60% but-for market share is retained. Setting the
actual share to be 85% and the but-for share 75%, without changing anything else in Dr. Singer's

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[118] Dr. Singer acknowledges that "a developer would not have to offer Apps on multiple stores in order to benefit
from the results of competition in the but-for world. The mere threat of developers defecting to a competing
platform, combined with actual defection (and steering) by other developers, would spur Google to decrease its
take rate, in order to keep as many developers as possible on its platform." Singer Class Rebuttal Report ¶62.
Yet, he never accounts for the adverse effects this outcome may have on some consumers.

[119] I also note that Dr. Singer argues that Google had proposed ███████████████████████████████████
██
Singer Report ¶ 205. However, I understand that ████████████████ was never implemented.

[120] I show how his other models change with alternative market share values in Exhibits 8a-8b.

[121] This is driven by that in Dr. Singer's damages models, Google Play's consumer-side and developer-side demand
elasticities are derived based on the formula in Landes and Posner (1981), $E_g = \frac{E_M}{S_g} + \frac{E_S(1-S_g)}{S_g}$. For the app
distribution market model, the single take rate model, and the single market hybrid model, Dr. Singer assumes
the competitor supply elasticity E_S to be zero, hence leading to $E_g^{BF} = \frac{E_M}{S_g^{BF}} = E_g^A \frac{S_g^A}{S_g^{BF}}$. The higher $\frac{S_g^A}{S_g^{BF}}$ is, the
higher the but-for consumer and developer price elasticities would be, resulting in lower but-for service fee rate
and app price, and hence higher consumer damages. This holds directionally true for the IAP aftermarket model,
even though he does not assume E_S to be zero in that model.

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model, reduces Dr. Singer's damages by 68.5%. Dr. Singer's other overcharge damages models are similarly highly sensitive to economically plausible changes to his market share assumptions.[122]

Figure 9.   Percentage Change in Consumer Class Damages based on Dr. Singer's Combined Market Take Rate Model with Alternative Google Play Market Shares
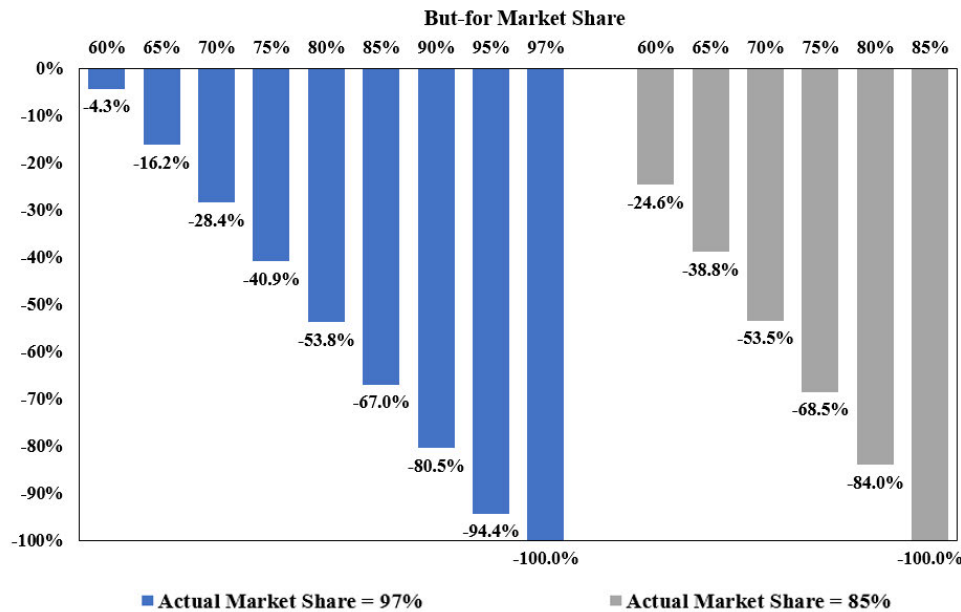
Source: See Exhibit 7b.

98.   **Shape of the Demand Curve.** Dr. Singer assumes that the actual and but-for market consumer price elasticities are the same, which implies that Dr. Singer is assuming in his models that aggregate consumer demand has a "constant elasticity" functional form.[123] As noted above,

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[122] As noted below, the theoretical models that Dr. Singer uses in his consumer subsidy damages models are also sensitive to changes in the assumptions about the actual and but-for Google Play shares.

[123] Specifically, in all of Dr. Singer's models except the IAP model and Amazon discount model, he calculates the but-for buyer-side product price demand elasticity faced by Google Play, i.e., the change in the quantity demanded for consumers for transactions in a given alleged market (i.e., for Android app distribution market transactions in the model for the app distribution market) from Google associated with a change in the app product price based on the Landes and Posner (1981), $E_g = \frac{E_M}{S_g} + \frac{E_S(1-S_g)}{S_g}$. In all these calculations, he assumes that the market buyer-side demand elasticity (E_M), i.e., the change in the market-wide quantity demanded for consumers for transactions in a given alleged market associated with a change in the market app product price change, to be the same in the actual and but-for worlds. This implies that Dr. Singer is assuming in his models that

different choices regarding demand curve shape have different consequences for the rate of pass-through for marginal cost and service fee rate changes. Other outcomes of a theoretical model likewise can depend on the particular demand curve shape that is assumed in the model. For example, for some demand curve shapes, the elasticity of demand increases as the price increases.[124] A model that assumes such a demand curve shape is likely to predict a smaller price increase due to a structural change (such as a cost increase) than an otherwise equivalent model that assumes a demand curve shape for which the elasticity of demand stays constant as price increases. The reason is that the increasing elasticity of demand makes it increasingly costly (in terms of lost sales) for the firm to increase its price.

99.   Had Dr. Singer assumed a different functional form for demand than constant elasticity, his models would have produced different overcharge damages figures. The differences that result from different functional form assumptions can be substantial. For example, had Dr. Singer used linear demand instead of constant elasticity demand, he would have calculated smaller overcharge damages figures. Dr. Singer acknowledges that the demand curve can take different shapes and discusses other choices of demand curves, including a downward-sloping linear demand curve.[125] Yet, despite the importance of the choice of demand curve shape for his damage models, Dr. Singer failed to provide any empirical or other support for his choice of the constant elasticity demand curve shape over other shapes, such as linear.

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that the market consumer demand has a "constant elasticity" functional form, i.e., the market consumer price demand elasticity stays the same at different product price points. His IAP model does not involve consumers (since he alleges the IAP market is one-sided) and follows the same calculation for developers. Therefore, I apply the same sensitivity analysis to the developer side for the IAP model. Dr. Singer's Amazon discount model does not rely on demand elasticity calculations at all.

[124] Linear demand is an example. For a linear demand curve $Q = \alpha - \beta P$, the elasticity of demand at price P is $-\beta P / (\alpha - \beta P)$. This expression becomes a larger number in absolute value as P increases.

[125] Singer Report ¶ 336 and Singer Class Rebuttal Report ¶ 74.

100.   To illustrate how the demand functional form could affect Dr. Singer's overcharge damages calculations, I replace the constant price elasticity demand function with a linear demand function for the market consumer demand in Dr. Singer's overcharge damages models, while keeping everything else in his models unchanged. With a linear demand curve, the pass-through rate is 50% with constant marginal costs,[126] and the but-for market-wide consumer price elasticity would also be lower as compared to Dr Singer's estimates, leading to lower consumer damages. Intuitively, this is because, with a downward-sloping linear demand curve, the consumer product price elasticity decreases with price.[127] Since Dr. Singer's damages models all predict a lower but-for price, the but-for market-wide consumer product price elasticity would be lower. As shown in Figure 10, using a linear market demand function, Dr. Singer's calculation of overcharge damages based on combined download/IAP would decrease by about half.

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[126] Pless, Jacquelyn, and Arthur A. van Benthem, "Pass-through as a test for market power: An application to solar subsidies." *American Economic Journal: Applied Economics*, Vol. 11, No. 4, 2019, p. 374.

[127] See, e.g., Robert S. Pindyck and Daniel L. Rubinfeld 1995, Microeconomics, 3rd edition, 1995, p.30 ("Slope is constant for this linear demand curve. Near the top, price is high and quantity is mall, so the elasticity is large in magnitude. The elasticity becomes smaller as we move down the curve.")

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Figure 10.   **Percentage Change in Consumer Class Damages based on Dr. Singer's Damages Models with A Linear Demand Curve**
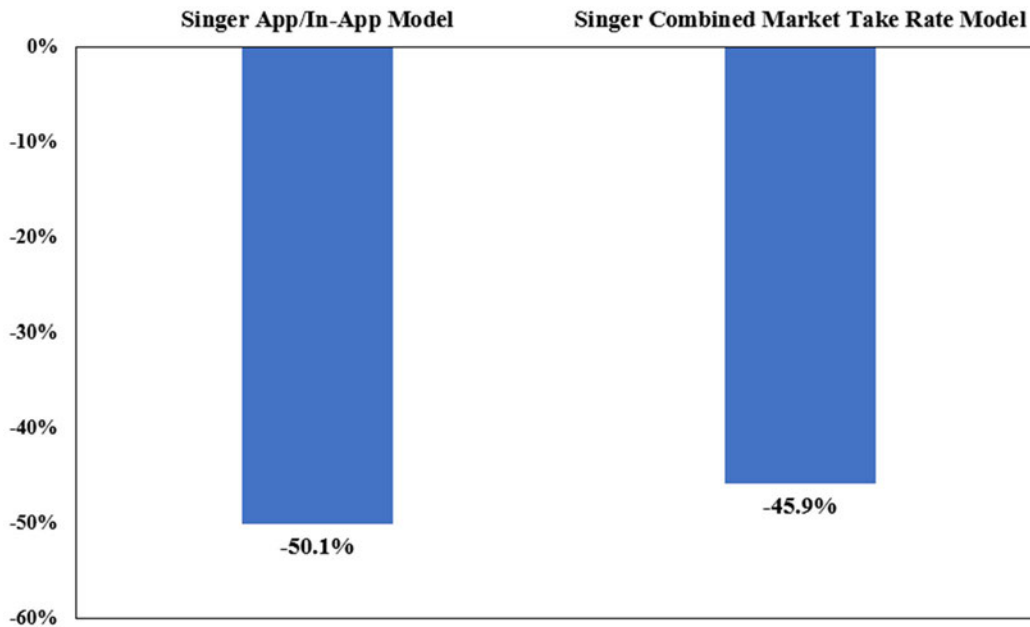
Source: See Exhibit 7c.

101.   **Competitor Supply Elasticity.** In his IAP model, Dr. Singer assumes the supply elasticity of Google Play's competitors in the alleged IAP market, i.e., "the percentage increase in the quantity [of the in-app aftermarket services] supplied by Google's rivals, given a one percent increase in Google's price," to be 4.38 in the but-for world based solely on the estimated supply elasticity for AT&T's long-distance wireline telephone service competitors in the 1980s.[128] Dr. Singer does not conduct any empirical analysis or provide any supporting evidence to demonstrate that the elasticity of competitor supply for IAP in the but-for world would have been 4.38. As was the case for the Google Play but-for market share, Dr. Singer provides no support for the claim that the experience of the long-distance wireline telephone service in the 1980s provides a reasonable benchmark for what would have happene in the but-for world in this case.

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[128] Singer Report ¶¶ 326, 328, and 332.

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102.   For the reasons previously discussed, the two situations are not similar along any important economic dimension. It is instructive to review the Kahai, et al. (1996) research paper that estimated the competitor supply elasticity of 4.38 that Dr. Singer uses. Kahai, et al. (1996) assumed a dominant firm/competitive fringe (DF/CF) model, which imposes assumptions on the market structure, including that "(1) there is one firm that holds a relatively large share of the market (that is, the dominant firm); (2) there is a competitive fringe, consisting of a large number of much smaller firms, each of which takes the dominant firm's price as given; and (3) the product is homogeneous."[129] Unlike Dr. Singer, Kahai, et al. (1996) made an effort to show that the characteristics of the long-distance wireline telephone service industry, in a limited time period, "conform reasonably well with the assumptions underlying the DF/CF model."[130] For example, for the competitive fringe assumption, the paper shows that in the time period studied AT&T faced a "considerably fragmented set of individually relatively small competitors," with the number of competitors being 170 at the beginning of the time period studied and growing to 440 at the end, and no single competitor holding more than 6% of the market share during the time period studied.[131] For the product homogeneity assumption, the paper compares the functions and features of the long-distance calling services as well as consumers' willingness to switch long-distance carriers to support that the long-distance services were viewed by consumers as essentially homogenous.[132]

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[129] Simran Kahai, David Kaserman & John Mayo, "Is the 'Dominant Firm' Dominant? An Empirical Analysis of AT&T's Market Power," 39 Journal of Law & Economics 499-517 (1996) (hereafter "Kahai et al. (1996)"), p. 502.

[130] Kahai et al. (1996), p. 505. In fact, as the paper points out, even the applicability of the long-distance wireline telephone service industry declines as the industry structure evolves. See Kahai et al. (1996), p. 513.

[131] Kahai et al. (1996), p. 503.

[132] Kahai et al. (1996), pp. 503-504.

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103.   In contrast,, Dr. Singer did nothing to show that his IAP market in the but-for world would have had these same characteristics and, in fact, empirical evidence suggests that it would not. For example, Dr. Singer's own purported IAP market includes PayPal, Stripe, and other payment processing services as potential competitors. These competitors would not be "fringe" price takers. PayPal holds a market share by the number of transactions of 54% in the online payment processing market, and Stripe holds a market share of 19%.[133] These competitors are by no means "much smaller" price takers, and in fact they offer different pricing.[134] Moreover, Dr. Singer assumes that in the but-for world Google would have lost 40% market share to a single competitor. Such a firm could hardly be called a "fringe" firm with a "trivial share of the market." Therefore, Dr. Singer's input of 4.38 for the competitor supply elasticity in his IAP model is unsupported and arbitrary.

104.   Below I illustrate the sensitivity of Dr. Singer's damage estimates to the choice of competitor supply elasticity in Figure 11 below, keeping everything else in his model the same. For example, changing the supply elasticity to 2 leads to a 7.5% reduction in Dr. Singer's damages estimate, and changing the supply elasticity to 0 leads to a 26.7% reduction in Dr. Singer's damages estimate.

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[133] See https://www.datanyze.com/market-share/payment-processing--26, https://www.cardrates.com/advice/credit-card-processors-market-share/.

[134] For example, Paypal and Stripe's pricing systems have different rates for different types of transactions. According to PayPal's website, the typical US rate for "All Other Commercial Transactions" is 3.49% plus a fixed fee of $0.49. "Standard Credit and Debit Card Payments," are priced at 2.99% plus the $0.49 fixed fee. Stripe charges 2.90% + $0.30 for card payments and 2.90% rate + $0.30 fee plus $10/month subscription for checkout.   For example, Square charges 2.6% + 10c. https://squareup.com/us/en/campaign/square-vs-competitors. Stripe charges 2.9% + 30c, plus additional fees for services such as invoicing. https://stripe.com/pricing#pricing-details. Amazon Pay is free for small businesses; https://pay.amazon.com/business/small-business.

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Figure 11.   Percentage Change in Consumer Class Damages based on Dr. Singer's IAP Model with Alternative Competitor Supply Elasticities
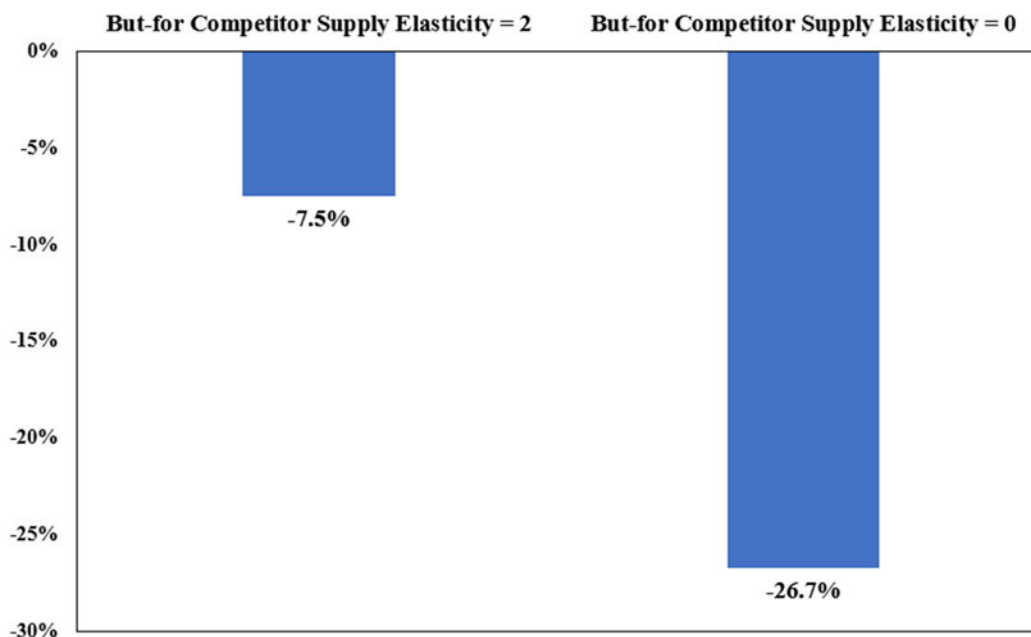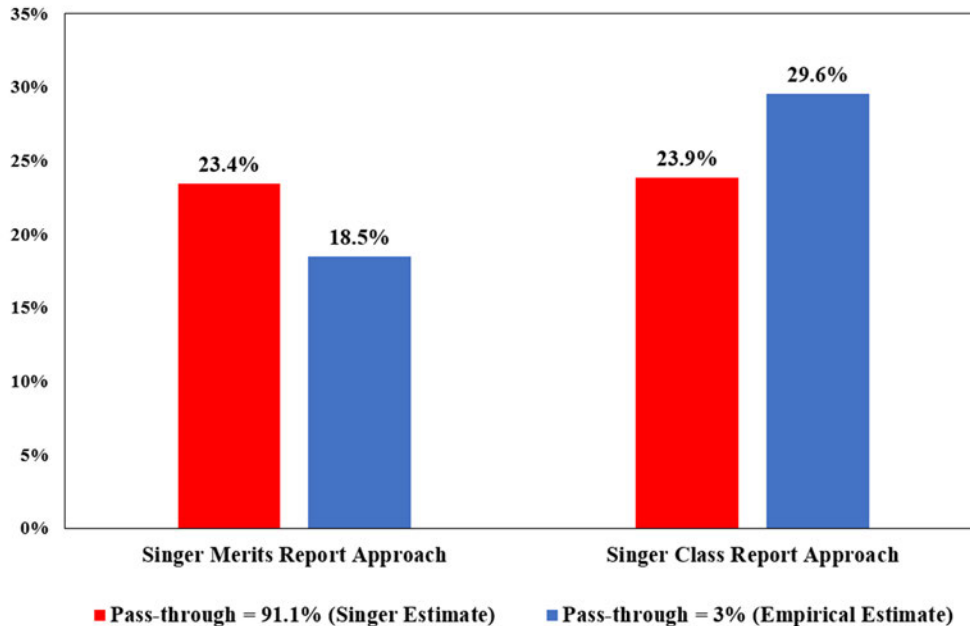

Source: See Exhibit 7d.

105.   **Other Model Parameters.**   Dr. Singer applied different assumptions to calculate the developer take rate elasticity, i.e., the change in the quantity supplied by developers in each alleged market in response to change in the service fee (dollar amount), in his merits report dated October 3, 2022 from his class report dated February 28, 2022: in his class report, he assumed the developer take rate elasticity to be the same in the actual and but-for worlds, while in the merits report, he assumed that the but-for developer price elasticity would have been the actual developer price elasticity divided by the but-for market share (60%).[135]   This difference alone, besides increasing the consumer damages, changes the relationship between some of his key model outputs.   As shown in Figure 12 below, in his app distribution market, keeping other assumptions and input the same, the but-for take rates under his merits report approach are generally lower with *lower* pass-

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[135] Singer Class Report Table 6; Singer Report Table 8.

through rates, while the but-for take rates under his class report approach are generally *higher* with

lower pass-through rates.

Figure 12.   But-For Take Rates based on Dr. Singer's Class Report and Merits Report Combined Market Take Rate Model with Empirical Pass-Through Rate Estimate

Source: See Exhibit 7e.

Overall, Dr. Singer's damage models are sensitive to his choices of model inputs. As an illustration

of the combined effect of the model inputs discussed above on his damages estimates, I show in

Figure 13 below that Dr. Singer's combined downloads/IAP model yields damages estimates from

as low as zero to ▮▮▮▮▮, assuming a pass-through rate of 3% and alternative values for

Google's actual and but-for market shares. See Exhibits 8a-8b for the combined sensitivities of

Dr. Singer's other overcharge models.

Figure 13.   Consumer Class Damages Sensitivities Based on Dr. Singer's Combined Market Take Rate Model
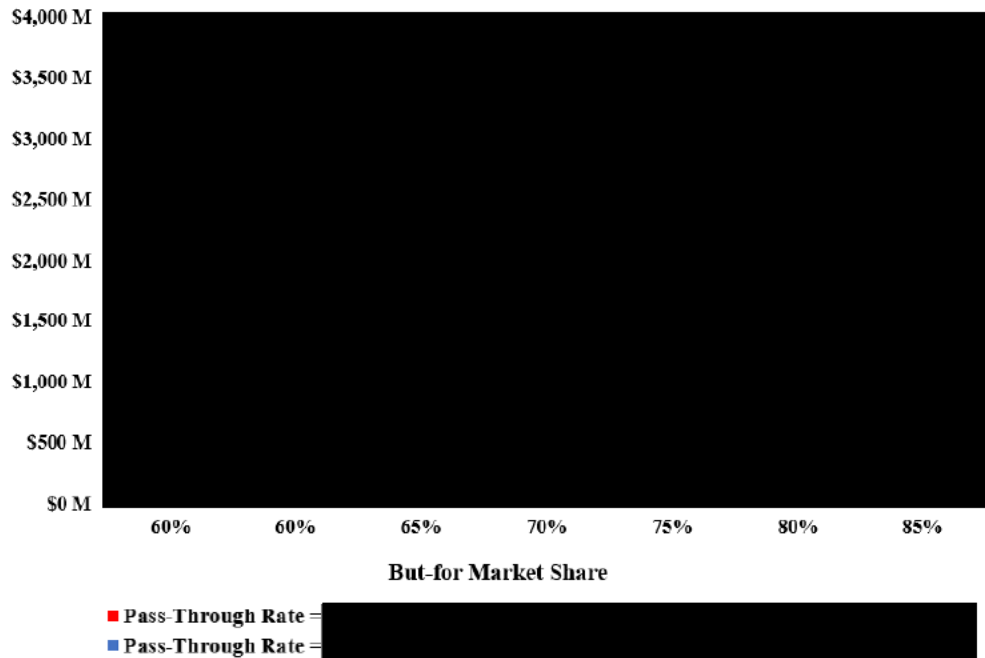
Source: See Exhibit 7f.

b. The Landes and Posner (1981) Model Is Not a Sound Fit for Calculating Google Play's But-for Firm-Specific Price Elasticities

106.   Dr. Singer calculates Google Play's consumer-side and developer-side firm-specific price elasticities in the but-for world following the formula for a firm-specific price elasticity derived in Landes and Posner (1981).[136] However, as explained in that paper, the firm-specific price elasticity is derived based on a market structure of "a single large or dominant firm … that faces competition in its sales from a fringe of domestic firms … each with a trivial share of the market" and that "all the firms in the market produce the same product."[137] The paper explicitly states that

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[136] Landes and Posner (1981) at 944. Specifically, the formula is $E_g = \dfrac{E_M}{S_g} + \dfrac{E_S(1-S_g)}{S_g}$, where E_g and E_M are price elasticities of demand for Google Play and for market-wide, S_g is Google Play's market share, and E_S is the elasticity of competitor supply.

[137] Landes and Posner (1981) at 944.

"[w]hat is critical is … that each member of the fringe have a small share, implying that the fringe firms have little incentive to engage in strategic behavior and thus that each is a price taker. If the other firms are not price takers, our analysis is not directly applicable."[138] To emphasize this point, Landes and Posner (1981) state that "the formula for the firm elasticity of demand technically is inapplicable when there is interdependent behavior among the leading firms."[139]

107.   As discussed above, Dr. Singer conducts no empirical analysis and provides no support to show that the app distribution, IAP, and download/IAP markets in the but-for world satisfy the assumptions under the DF/CF model. In fact, the market structure requirement in the Landes and Posner (1981) model is inconsistent with Dr. Singer's but-for world characterization that "my analysis of a potential but-for world requires entry by only one viable rival App store platform."[140] In addition, empirical evidence indicates that competitor app stores (such as ONE Store, Amazon Appstore, and Aptoide) adopt different pricing schemes from Google Play, proving them not as price takers. Moreover, Dr. Singer assumes that this (potentially) single but-for app store would have achieved a 40% share in the but-for world. Such a firm could hardly be called a "fringe" firm with a "trivial share of the market."

C.   Dr. Singer's Consumer Subsidy Damages Calculations

108.   The fourth and the sixth of Dr. Singer's damages calculations focus on the subsidies that Google provided to consumers through Google Play Points. In the fourth calculation, Dr. Singer employed the same theoretical model as in the third calculation but assumed that consumer subsidy could have changed in the but-for world, while the service fee rate would have stayed fixed at the

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[138] Landes and Posner (1981), fn. 15.

[139] Landes and Posner (1981), p. 951.

[140] Singer Report ¶ 289

actual level. In the sixth calculation, Dr. Singer takes a different approach where he uses the consumer discounts provided by the Amazon Coins program as a benchmark for Google's consumer subsidies in the but-for world. Both of these calculations are flawed and unsupported.

1. All the Flaws of Dr. Singer's Theoretical Model Discussed Above Apply to the Consumer Subsidy Damages Calculation as Well

109.   All of the invalid assumptions of Dr. Singer's theoretical model—the actual and but-for Google Play shares, the demand curve shape, the competitor's supply elasticity—render Dr. Singer's consumer subsidy damages calculation flawed and unsupported, just as they do Dr. Singer's overcharge damages calculations.[141] In Exhibit 8c, I perform the same set of calculations using alternative values of the key parameters to demonstrate the sensitivity of Dr. Singer's consumer subsidy damages calculation.

2. Dr. Singer's Amazon Benchmark Calculation Relies on Flawed Calculations and Assumptions

110.   In the consumer subsidy damages calculation based on using the Amazon Appstore as a benchmark, Dr. Singer first calculated the implied discount rate on Amazon Appstore purchases on third party devices to be ███████, and then assumed that in the but-for world Google Play would have offered consumers subsidies or other discounts in the amount of ██████ of consumer spend (say, via Google's Play Points program[142]). Dr. Singer asserts that the difference between ███████

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[141] For the consumer subsidy damage calculations, Dr. Singer does not address pass-through, presumably because subsidies are directly provided by Google to consumers. However, under Dr. Singer's own arguments concerning the pass-through of the service fee, there could be "reverse" pass-through of a subsidy, whereby developers increase their app prices in response to the increase in subsidies. Such app price increases would offset the consumer subsidies. Dr. Singer does not consider this possibility. The possibility of such a reverse pass-through of consumer subsidy has been recognized in academic literature as well. See, e.g., Fan, Y. and Zhang, G. (2022), The welfare effect of a consumer subsidy with price ceilings: the case of Chinese cell phones. The RAND Journal of Economics, 53: 429-449.

[142] According to Dr. Singer, "Google awards Play Points for: (1) any purchase; (2) participation in weekly promotions (essentially getting extra points for spending on particular top games); and (3) installing new Apps

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and the actual Google Play consumer subsidy of ▮▮▮▮, applied to Google Play's consumer spend, represents consumer damages in the form of lost consumer subsidies.[143] This estimate is ▮▮▮▮ larger than his other consumer subsidy damages calculation based on the theoretical model. He provides no explanation for this sizable difference. In fact, such a large difference illustrates that one or both calculations are incorrect.

111.   In any event, Dr. Singer's consumer subsidy damages calculation based on the supposed Amazon discount is flawed and unsupported for a number of reasons. First of all, to the extent Dr. Singer is comparing Amazon Coins to Google's own customer loyalty program Google Play Points, the two are not comparable. Amazon Coins must be purchased in a separate transaction before they can be used to make digital purchases in the Amazon Appstore. Once purchased, Amazon Coins can no longer be converted back to cash.[144] In addition, a consumer must make a minimum purchase of 300 Amazon Coins and pay sales taxes, and the discount is lower on lower transaction amounts.[145] Given these restrictions, Amazon must offer some form of discount to entice consumers to convert cash into the virtual currency.[146] While one dollar worth of cash can be used to pay for anything in both the digital and physical settings, one dollar worth of Amazon Coins can only be used for digital purchases in a single specialized online store, and nothing else.[147]

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that Google selects. The points can then be spent on (a) Play credits (money to buy games); (b) priced initial App downloads or In-App Content; or (c) discounts on In-App Content. Consumers may also reach higher "tiers" as they accrue points, which gives them access to additional benefits." Singer Report ¶ 373.

[143] Singer Report ¶ 420.

[144] https://www.amazon.com/gp/help/customer/display.html?nodeId=201434520 (Section 2.5).

[145] https://www.amazon.com/dp/B06XCYXMQP?ie=UTF8&asin=B06XCYXMQP&denomination=300; AMZ-GP_00001629.

[146] This is akin to the well known liquidity discount, that is, assets with liquidity restrictions trade at a discount. See, e.g., Bajaj, M., Denis, D. J., Ferris, S. P., & Sarin, A. (2001); Firm value and marketability discounts. J. Corp. L., 27, 89.

[147] https://www.amazon.com/gp/help/customer/display.html?nodeId=201434520 (Section 2.1); https://www.amazon.com/b?ie=UTF8&node=21434128011

Google Play points, however, are earned with purchases that a consumer makes, rather than being purchased by the consumer. No separate transaction is involved, and they are generated as a "by-product" of a transaction the consumer often would make in the absence of the Play Points. Once Play Points are earned, they can be used directly to lower prices a consumer pays on future purchases within the Google Play store. In addition, Amazon coins *cannot* be used to buy in-app subscriptions and yet Dr. Singer applies his discount rate, which is largely based on Amazon Coins, to all types of purchases on Google Play including subscriptions,[148] nor can they be used together with cash or other forms of payment.[149] That means a user must buy additional coins if he or she does not have enough coins to make a purchase. For example, if a user buys 300 coins, but wants to buy something that requires 400 coins, the user would have to buy another 300 coins because they cannot use cash or another form of payment to make up the difference.[150] Play Points do not have such restrictions. Therefore, the discount amount based on Amazon Coins is not comparable to the discounts represented by Play Points. Dr. Singer speculates that "[m]ore broadly, Google could adopt other methods (akin to Amazon Coins) for providing direct consumer discounts." However, he offered no reason why Google would do so in the but-for world other than supposedly greater competitive pressure. Given the unique nature of the Amazon Coins, Dr. Singer cannot compare Amazon Coins-based discount to a very different Google Play-Points based discount that Google offers. Dr. Singer also does not make any adjustment to make them comparable.

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[148] See Morrill Deposition, Exhibit 1363.

[149] https://www.amazon.com/b?ie=UTF8&node=21434128011; https://arstechnica.com/information-technology/2013/05/amazons-new-virtual-currency-of-dubious-benefit-to-customers/; https://techengage.com/amazon-coins-deals/

[150] https://techengage.com/amazon-coins-deals/; https://arstechnica.com/information-technology/2013/05/amazons-new-virtual-currency-of-dubious-benefit-to-customers/.

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112.   Second, Dr. Singer claims that the Amazon discount on third party devices provides "a reasonable benchmark for calculating aggregate damages" but his only justifications for this claim are that (1) the Amazon Appstore also participates in the claimed Android App Distribution Market and (2) the Amazon Appstore is also available on third-party (i.e., non-Amazon) smartphones and tablets.[151]   Dr. Singer's logic would imply that, whenever a premium brand product and a private label product are both in the same product market and they are both sold in third-party retail stores, the discounts offered by the two products must be comparable and similar. This is clearly false. As a matter of basic economics, discounts, like prices, depend on a host of other market factors including consumer demand, firms' business strategy, costs, and the competitive landscape. Dr. Singer says nothing about why the consumer demand, costs, business strategy, and competition for the Amazon Appstore on third party devices in the actual world would be similar to that of Google Play in the but-for world – users of the Amazon Appstore on third party devices and their demand may not be similar to Google Play store users, either in the actual or the but-for worlds. In fact, as Amazon's own strategy documents show, ███████████████████████████ ██ ██████.[152] Further, Dr. Singer has stated elsewhere in his report that Amazon Appstore is much smaller (███ of the market), and Amazon Appstore on third party devices would represent an even smaller user base.[153]

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[151] Singer Report ¶ 418.

[152] Singer Report ¶ 418.

[153] Singer Report ¶ 120, citing Amazon documents. ████████████████████████████ ██

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113.   Moreover, Dr. Singer also does not present any evidence that the Google Play store would have been in a similar economic situation in the but-for world to the Amazon Appstore on third party devices in the actual world. Dr. Singer also does not provide any evidence why Google Play would have adopted the same business and pricing strategy as Amazon Appstore on third party devices, especially given that Amazon is known to price aggressively and even below cost in the context of complementary products.[154]

114.   Third, Dr. Singer calculates the ████ as percentage of the total discounts out of total gross consumer spend on third party devices from 2018 to 2021, and claims that "the vast majority of discounts come in the form of Amazon Coins."[155] The Amazon Appstore total sales on third-party devices are about ████ between 2018 and 2021. However, this is a small slice of the overall Amazon app store sales. For example, Amazon Appstore sales are much greater on FireTV and tablets (each has total sales above ████ between 2018 and 2021) and Amazon offers a much lower rate of discounts on those devices – ██ for FireTVs and ██ for tablets between 2018 and 2021.[156] Although Amazon devices do not offer downloads of alternative app stores, it is still possible to sideload them, much as is the case with most Android devices.[157] Therefore, Dr.

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[154] Amazon has a documented history of pricing certain products at or below cost in order to gain market share or induce sales of adjacent products. Around 2011, Amazon launched the Kindle Fire tablet below cost, with the goal of inducing other sales (such as books, apps, advertising and Amazon shopping) on the platform. The Atlantic, citing IHS iSuppli, says that the tablet cost more than $209 to build while sold at $199. See "Yes, the Kindle Fire is a Loss Leader," *The Atlantic,* www.theatlantic.com, October 1, 2011, https://www.theatlantic.com/technology/archive/2011/10/yes-kindle-fire-loss-leader/337237/.

[155] Singer Report, fn. 954. However, Dr. Singer never explains exactly what discounts are included in his ████. According to Morrill deposition exhibit 1364, total discounts include ████ and ████ Dr. Singer did not explain what ████ entails and why that is the right information to use in his calculation. Morrill Exhibit 1364.

[156] Morrill Deposition, Exhibit 1363.

[157] See, among others, How to Install the Google Play store on an Amazon Fire, https://www.wikihow.com/Install-the-Google-Play-Store-on-an-Amazon-Fire#:~:text=However%2C%20Fire%20OS%20runs%20on,the%20four%20required%20APK%20files., accessed November 5, 2022.

Singer has no valid basis to use only the discounts on third party devices and ignore the much smaller discounts Amazon offers on its own devices.

115.   Elsewhere in his report, Dr. Singer claims several other app stores are reasonable benchmarks as well and yet he did not even examine the discounts offered by any store other than Amazon. I discuss these benchmarks in detail in section IX. Dr. Singer has not offered any evidence as to why Amazon on third party devices is either uniquely comparable to Google Play in the but-for world or Amazon app store's discount on third party devices is representative of all the other benchmarks he considers; in fact, it is not even representative of the Amazon Appstore on other devices as discussed above.

D.   Dr. Singer's Hybrid Damages Calculation

116.   Dr. Singer performs a hybrid damages calculation using the theoretical model for downloads/IAP where he allows both the service fee rate and the consumer subsidy to change in the but-for world. Thus, this calculation is a hybrid of a service fee overcharge damages calculation and a consumers subsidy damages calculation.

117.   All the flaws that render Dr. Singer's overcharge and consumer subsidy calculations (based on the theoretical model) unsupported apply to the hybrid calculation as well. In Exhibit 8e, I summarize the ways in which Dr. Singer's hybrid calculation changes in response to same changes to the model assumptions that I have discussed above in the context of the overcharge and consumer subsidy calculations.

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VII.   CONSUMERS – DR. RYSMAN'S DAMAGES CALCULATIONS

A.   Overview of Dr. Rysman's Damages Calculations

118.   Dr. Rysman offers an overcharge damages calculation (that assumes the service fee rate would have been lower in the but-for world than the actual world, but the number of apps would have been the same), a variety damages calculation (that assumes that the number of apps would have been higher in the but-for world than the actual world, but that the service fee rate would have been the same), and a hybrid calculation (that assumes that both the number of apps would have been higher and the service fee rate would have been lower in the but-for world than in the actual world).[158]

B.   Dr. Rysman's Service Fee Overcharge Damages Calculation

119.   Dr. Rysman calculates consumer damages based on the assumption that the Google Play service fee rate in the but-for world would have been 15% and that the pass-through rate of service fees by app developers to consumers is 100%. Under these assumptions, service fee overcharge damages are consumers' Google Play dollar spend multiplied by 15%.

1.   Dr. Rysman's Assumption of a 15% But-For Google Play Service Fee Rate is Invalid

120.   Dr. Rysman asserts that "an upper bound on a service fee in the Android App Distribution Market in a but-for world in which Google does not monopolize the Android App Distribution

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[158] Dr. Rysman uses his models to calculate damages for consumers in the Plaintiff States for the periods of August 16, 2016, through May 31, 2022, and August 16, 2016, through June 5, 2023. I note that in addition to the flaws in his damage models discussed below, there is no reason for Dr. Rysman to calculate damages beyond the end of the period for which sales data exist. To do so, he makes projections of sales, but these projections are speculative (for example, he does not account for confounding economic factors, such as the effect of the recent pandemic on sales, in his projections). Rather than calculating damages on unsupported sales projections, Dr. Rysman could calculate damages based on the actual sales data when those data become available.

Market would be 15%."[159] His only rationale for choosing the specific 15% figure appears to be

that (1) Google has offered a similar rate to a small number of selected developers and the recent

Google policy changed the service fee rate to 15% for certain types of transactions[160] and (2) "in

the competitive but-for world competitive pressure on Google would be what Google has faced so

far in the actual world plus additional pressure due to enhanced competition."[161] Dr. Rysman

provided no justification, however, as to why, in the but-for world, Google would set a uniform

15% service fee rate across all transactions, all developers, and the entire alleged damages period.

In fact, Dr. Rysman says nothing specific about the competitive conditions in the but-for world,

other than claiming that Google would face more "competitive pressures."[162]

121.   I note that Dr. Rysman's 15% but-for service fee rate is inconsistent with Dr. Singer's but-

for service fee (23.4%) based on the Singer combined market take rate model. Dr. Rysman's

overcharge damages calculation would be reduced by over half if he were to use Dr. Singer's

23.4% but-for service fee rate.

2. Dr. Rysman's Assumption of 100% Pass-Through Is Unsupported and Inconsistent With the Empirical Evidence

122.   Dr. Rysman offers no support or defense for his assumption of a 100% service fee pass-

through rate. Rather, he merely states that if another expert argues that pass-through is less than

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[159] Rysman Report ¶ 474.

[160] Rysman Report ¶ 495. ("I conclude that (i) an upper bound on competitive but-for service fee is most likely to be 15% which is consistent with most of the service fee discount programs that Google has implemented…")

[161] Rysman Report ¶ 536.

[162] Rysman Report ¶ 537. See also Rysman Report ¶ 475 ("If Google, in addition, faced competition in the Android App Distribution Market, then the service fee would reduce further thus making 15% a conservative estimate.")

100%, he reserves the right to adjust his damages calculation.[163] Dr. Rysman has certainly offered

no empirical analysis of service fee rate pass-through.

123.   To the extent that Dr. Rysman attempts to point to his theoretical model as support for his

100% pass-through assumption, the model offers no such support. The 100% pass-through rate

that emerges from Dr. Rysman's model is simply the result of another unsupported assumption

about the shape of the demand curves for apps used within the model. Dr. Rysman's particular

choice of demand curve shape *dictates* that, within the model, 100% of a change in the service fee

rate is passed through to consumers.[164] To be clear, the 100% pass-through in Dr. Rysman's model

is effectively an *assumption*, not the result of any empirical analysis.

124.   As noted above, it is well-established in the economics literature that, as a theoretical

matter, the rate of pass-through depends on the shape of the demand curve and other economic

conditions. With a different choice of demand curve, Dr. Rysman would have obtained a different,

potentially lower, pass-through rate in his model. In Appendix E to this report, I show that using

alternative demand curves within the basic structure of Dr. Rysman's model results in a pass-

through rate that is well below 100%. Assumptions regarding the pass-through rate that are

untethered to real-world evidence of the market being studied cannot be used to reasonably

estimate damages in the but-for world.

125.   The bottom line is that the rate of pass-through in a given real world context is an empirical

question that must be addressed through empirical analysis. Rather than conducting the necessary

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[163] Rysman Report, fn. 1133 ("To the extent that other experts in this case opine that consumers felt less than 100% of the price effect of Google's conduct, I reserve the right in rebuttal to testify about the effect of those different assumptions on my model's calculations.").

[164] Dr. Rysman's model assumes that demand for an app is of the "constant elasticity" form. Rysman Report Appendix F. He provides no support for this particular choice of demand curve shape.

analysis and building the results of that analysis into his theoretical model, however, Dr. Rysman has simply assumed 100% pass-through.[165] As discussed above, I have conducted an empirical analysis that demonstrates that service fee rate pass-through for Google Play store apps is well below 100%. Because Dr. Rysman's assumption on pass-through is entirely at odds with economic reality, his overcharge damages calculations (including the combined variety/overcharge calculations) are flawed.

126.   An additional theoretical point is that, with many demand curve alternatives to the particular one Dr. Rysman chose to use in his model, the service fee pass-through rate for an app is positively related to the app's marginal cost. Thus, for an app with relatively low marginal cost, the service fee pass-through rate can be close to zero as a theoretical matter.[166] In that case, real world pricing frictions such as an app's desire to use price points can lead to a zero real-world pass-through rate. For example, an app with low marginal cost and thus low pass-through may choose to remain at a preferred price point rather than change price slightly in response to a change in the service fee rate.

127.   As an initial matter, that marginal cost tends to be small and even negligible in some cases for digital goods is well-recognized. For example, Weber (2008) states that "Information goods such as computer software or electronic newspapers can be provided by firms at a low marginal cost, though in many cases large capital outlays are required to produce their first unit….For information goods, the costs of reproduction and distribution are indeed very small, so that this

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[165] In his pure "variety" damages calculation, Dr. Rysman assumes zero pass-through. However, this model is subject to different unsupported assumptions that drive the results. With this model, as discussed below, the assumptions are not only unsupported by any evidence, but in fact inconsistent with market facts.

[166] See Appendix E.

has become a standard assumption in much of the extant literature."[167]   Similarly, Jeffrey K. MacKie-Mason and Hal Varian (1994) state that "with information goods the pricing-by-replication scheme breaks down" and that "this has been a major problem for the software industry: once the sunk costs of software development are invested, replication costs essentially zero."[168] Lambrecht et al. (2014) state that "[s]uch [digital] goods are non-rival, have near zero marginal cost of production and distribution, low marginal cost of consumer search and low transaction costs."[169]

128.   Dr. Rysman argues that marginal cost is "likely" positive for apps. As he notes, the assumptions of his model require that marginal cost must be positive for all apps. He cites certain costs of specific developers and argues that they are marginal costs. However, Dr. Rysman's example of Pure Sweat Basketball is misleading. He argues that "the Pure Sweat Basketball (PSB) 2019 P&L statement shows ██ ████████████████████████████████████."[170] Based on PSB 2019 P&L statement, ██ ██.[171] Therefore, PSB's ██ ██ ████████████████████████.[172] Even if one takes Dr. Rysman's claim that those

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[167] Thomas A. Weber, "Delayed Multi-attribute Product Differentiation," Decision Support Systems, Volume 44, Issue 2, January 2008, pp. 447, 451.

[168] MacKie-Mason, Jeffrey K., and Hal Varian. "Economic FAQs about the internet." *Journal of Economic Perspectives*, Vol. 8, No. 3, 1994, p. 92.

[169] Lambrecht, Anja, et al., "How do firms make money selling digital goods online?" Marketing Letters, Vol. 25, No. 3, 2014, pp. 331-341 at 331.

[170] Rysman Report ¶ 566.

[171] Czeslawski Dep., Exhibit DX0268 (PSB-GOOGLE-0009320).

[172] Czeslawski Deposition, page 335: 10-19.

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are marginal costs, the ██ percent figure that he cited is based on PSB's ███████████

████ and is therefore misleading.

129.   Dr. Rysman then cites examples of other types of costs that he claims are marginal, yet he does no actual economic analysis to either quantify such costs or show that they are considered in price-setting for every app. Specifically, Dr. Rysman cites to the Epic Game P&L's breakdown of costs that ███

████████████. He goes on to argue that "[t]hose costs *can* [emphasis added] be considered marginal costs because, to increase sales (or continue to generate sales in future periods) or support existing customers, an app would need to pay more for advertising and marketing and pay wages (that is, an app would need to keep buying labor hours to continue selling its app over time and providing customer support)." Dr. Rysman makes similar arguments about several other types of costs such as advertising and marketing costs, cost per install, user acquisition costs, and hosting and cloud computing costs. However, for Dr. Rysman to argue that these are marginal cost, he must demonstrate that these costs are factored into the pricing decision of the developers, as his model implies.[173] He did not do so. Instead, Dr. Rysman simply argues that as long as a certain cost goes up with the number of users or usage, then it is a marginal cost that affects pricing. Dr. Rysman's argument here confuses marginal cost and (average) variable cost. As a firm grows and serve more customers, certain cost categories may increase as well.   However, the marginal cost associated with a small increase in sales may still be zero or near zero. Consider advertising and marketing expenses, for example. For a relatively large developer with a nontrivial marketing budget, the marginal cost associated with an additional user or an additional IAP purchase is likely

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[173] His model implies that the price depends on the marginal cost, see equation E.20, Appendix F, Rysman Report.

negligible. The same is true for wages and customer support, especially when the firm already has a sufficiently large volume of sales. Dr. Rysman argues that hosting and cloud computing costs also scale up with the number of users or usage, so they are also marginal costs.[174] However, he does not quantify such costs and nor show or even claim that they apply to every app. In fact, some developers may have excess infrastructure available, so that there would be no additional infrastructure costs associated with an additional user, IAP, or subscriber. Moreover, some apps do not require hosting or cloud computing at all.

130.   When discussing marginal cost, Dr. Rysman does not distinguish between users and usage. I explain above that the incremental costs of acquiring a new user should be small for a sufficiently large developer. However, even for the case of a developer with a non-negligible cost of acquiring an additional user or install, the marginal cost of additional usage may still be negligible. Again, consider a game app that offers IAPs for digital items such as an energy boost, a level up, or in-App digital currencies. When a user purchases one *additional* unit of any of those items in app, the incremental cost is likely negligible. In fact, Mr. Sweeney, CEO of Epic Games, testified that ███████████████████████████████[175] IAPs represent the large majority of sales through Google Play.

131.   Some apps incur non-negligible marginal cost, such as when they incur content or IP licensing costs with one additional paid user or one additional IAP purchase.[176]

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[174] Rysman Report 571.

[175] Trial Tr. (Sweeney) at 190:12-16, *Epic Games, Inc. v. Apple, Inc.*, No. 4:20-cv-05640-YGR (N.D. Cal.): ████

[176] It is worth noting that the structure of the licensing costs also matters. If the developer pays a lump sum amount for the license, then an additional user or purchase would not create an incremental licensing costs.

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132.   Dr. Rysman, while trying to highlight the types of costs that can be marginal cost, completely ignores the heterogeneity among different developers and has not provided any evidence to show that (1) these costs are factored into developers' pricing decision, as his economic model implies or (2) even if some costs are marginal, they are relevant and applicable to every app. A case in point, according to deposition testimony of one of the named developer class plaintiffs, LittleHoots, ██ ████████[177]

133.   In any event, as noted above, with alternative demand curves to the one chosen by Dr. Rysman, the service fee pass-through rate is positively related to marginal cost. Thus, if marginal cost is positive, but small, the pass-through rate can still be well below 100%. Moreover, with price points or other pricing frictions, the pass-through rate could be zero. Thus, Dr. Rysman's claim that marginal costs are "likely" positive does not by itself say anything about the pass-through rate. Dr. Rysman needs to layer on his demand curve assumption in order to get to the 100% pass-through rate and, again, that demand curve assumption is entirely unsupported.

C.   Dr. Rysman's Variety Damages Calculation

1. Dr. Rysman's Variety Damages Calculation is Based on a Flawed Theoretical Model That Has Little Connection to Economic Reality

134.   Dr. Rysman uses a highly stylized model to calculate what he claims are the damages to consumers from having fewer apps available in the actual world than they would have had in the but-for world (less "variety").   Dr. Rysman's model incorporates exactly two empirically determined figures—the own elasticity of demand for (paid) apps and the number of (paid) apps.

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[177] Ellis Dep. at 189: 9-193: 23.

All of the other features of Dr. Rysman's model are based on assumptions for which Dr. Rysman has offered no empirical support.

135.   A highly stylized model such as Dr. Rysman's may be useful for qualitatively investigating theoretical questions. However, such a model will not be suitable for quantitatively assessing damages in a real-world context if it fails to incorporate economically important aspects of that real-world context. Dr. Rysman's model fails to incorporate almost any of the economically important aspects of the real world Android app store marketplace. Thus, the model provides a flawed and unsupported basis on which to calculate variety (or any other form of) damages.

a.   Dr. Rysman's Model Does Not Account For Free and Ad-Supported Apps

136.   Dr. Rysman's model addresses only the ▮▮▮▮ apps on Google Play that are "paid" in some respect – paid download, IAP, or subscription. However, there are also ▮▮▮▮ apps on Google Play that are either free or ad-supported (and thus free to consumers).[178] Dr. Rysman completely ignores the free and ad-supported apps.

137.   This omission is problematic because some of the increased "variety" in paid apps that Dr. Rysman claims would have entered may in fact just have been apps switching from being free or ad-supported to being paid. That is, some developers of free or ad-supported apps may have chosen to convert these apps to paid in the but-for world if the service fee rate were lower. This is closely related to the concept of negative pass-through I discussed earlier. However, the increase in the number of paid apps resulting from such conversions would not represent an increase in

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[178] See the App Catalog data (GOOG-PLAY-001507601).

"variety" in the context of Dr. Rysman's model because those apps already existed as free or ad-supported apps. Dr. Rysman's model would mistakenly count them as "new" apps.

138.   Indeed, whether the impact of converting an app from free or ad-supported to paid is positive or negative is not clear a priori and is not a question that Dr. Rysman's model can even address. Consumers who used an ad-supported app may prefer viewing ads to paying for the app. Dr. Rysman's model assumes away any such differences among consumers.

b. Dr. Rysman's Model Does Not Distinguish Between Download Price, IAP, and Subscription Price

139.   Dr. Rysman's model assumes that each app generates revenue through the sale of a single "product" at a single "price." This is contrary to the workings of the actual marketplace. Many apps generate revenue through the sale of multiple products, such as the initial download and IAP. Other apps generate revenue through monthly subscriptions, which are different products than downloads or IAP. The demand curves, costs, or pass-through for these different products may well be different, but Dr. Rysman's model ignores these distinctions.

c. Contrary to All Evidence, Dr. Rysman's Model Assumes All Apps are the Same in Terms of Quality, Demand Function, Marginal Cost, Entry Cost, Price, and Quantity Sales

140.   Dr. Rysman assumes that all apps have the same quality parameter, the same demand function, the same marginal cost, the same entry cost, the same price, and the same quantity sales. Without this "symmetry" assumption, Dr. Rysman's model would be unworkable. For example, in the absence of the symmetry assumption, Dr. Rysman would have to specify the distribution of quality, marginal cost, and entry cost across the various apps, including apps that did not enter in the actual world, but would in his but-for world. He did not even attempt to identify an empirical

method by which these distributions could be estimated. However, "workability" is not a justification for using a flawed model to calculate damages.

141.   The symmetry assumption is obviously false with regard to price and quantity. Indeed, elsewhere in his report, Dr. Rysman recognized that apps are of different quality and the quality differences matter to consumer welfare.[179] Empirical evidence also shows that apps differ vastly in prices, quantity sales, and usage, as discussed below. Variation in price, quantity, and usage across apps suggests variation in quality, ████████ cost, and demand function across apps.

142.   Far from being the same, prices vary from ██ to █████ for paid apps and from ████ to ██████ for IAPs and subscriptions, as shown in Google Play's transactions in May 2022.[180] The variation is further illustrated in Figures 14 - 17 below, which plot the list prices of paid downloads and IAPs (including subscriptions) for game apps and non-game apps transacted in May 2022 respectively, with the horizontal axis showing the price point of a given dot (e.g., $0.99, $1.99) and the vertical axis showing the total quantity sales associated with the price point.[181] It is clear from the graphs that there are *many* different price points across apps. Even zooming in to just the top apps in Google Play, as shown in Figure 18, there are rarely two apps that have the same price – for top paid game apps, prices vary from $0.99 for "Rovio Classics: Angry Birds" to $7.49 for "Minecraft," and for top paid non-game apps, prices vary from $0.49 for "Halloween Animated WatchFace" to $14.99 for "FL STUDIO MOBILE."

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[179] See, for example, Rysman Report ¶ 492 ("Imperfect predictability of app quality, before its entry mitigates concerns that only low-quality apps would enter after the reduction of commissions.")

[180] I look at the monthly average prices of paid downloads, IAPs, subscriptions in May 2022.

[181] Since paid apps, IAPs, and subscriptions transacted in May 2022 may be a subsample of all the paid apps, IAPs, and subscriptions, the variations shown here may still under-represent the price variations across all the paid apps, IAPs, and subscriptions.

Figure 14.   Prices of Paid Downloads Transacted in May 2022 - Games
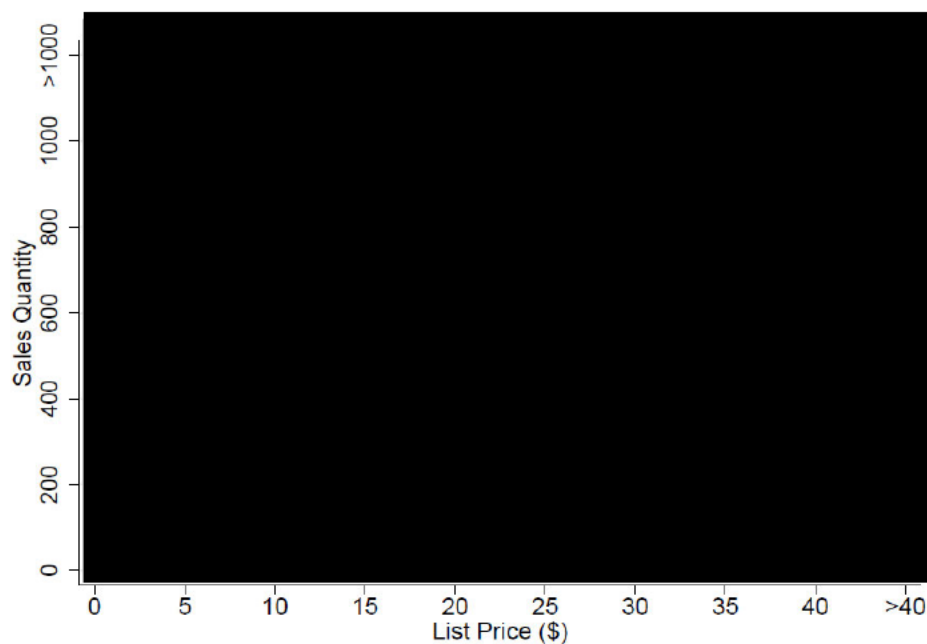
Source: See Exhibit 9a.

Figure 15.   Prices of Paid Downloads Transacted in May 2022 – Non-Games

Source: See Exhibit 9b.

Expert Report of Dr. Gregory K. Leonard
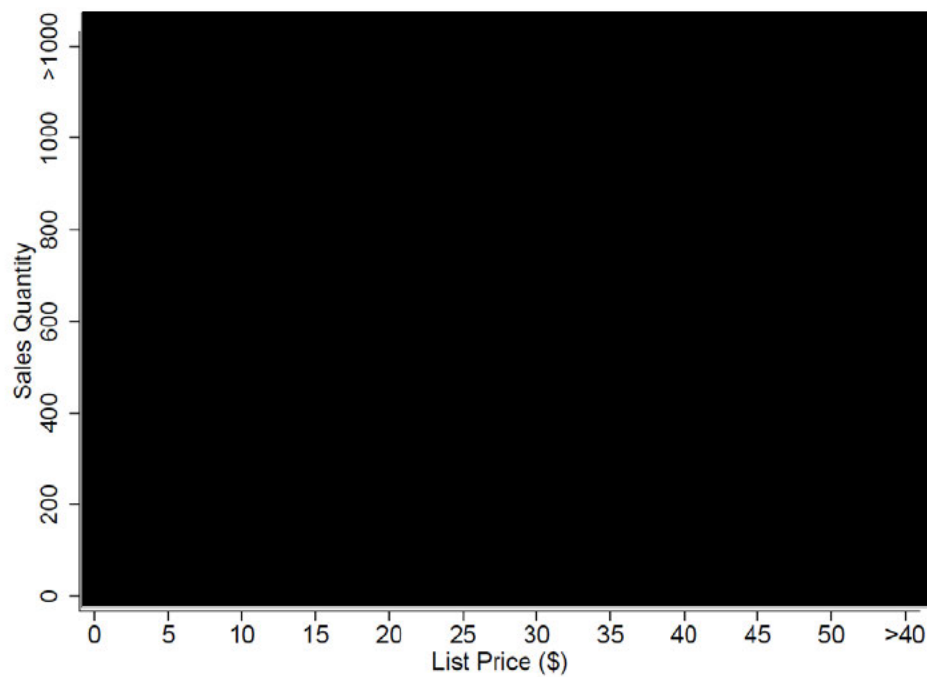
Figure 16.   **Prices of IAPs and Subscriptions Transacted in May 2022 - Games**
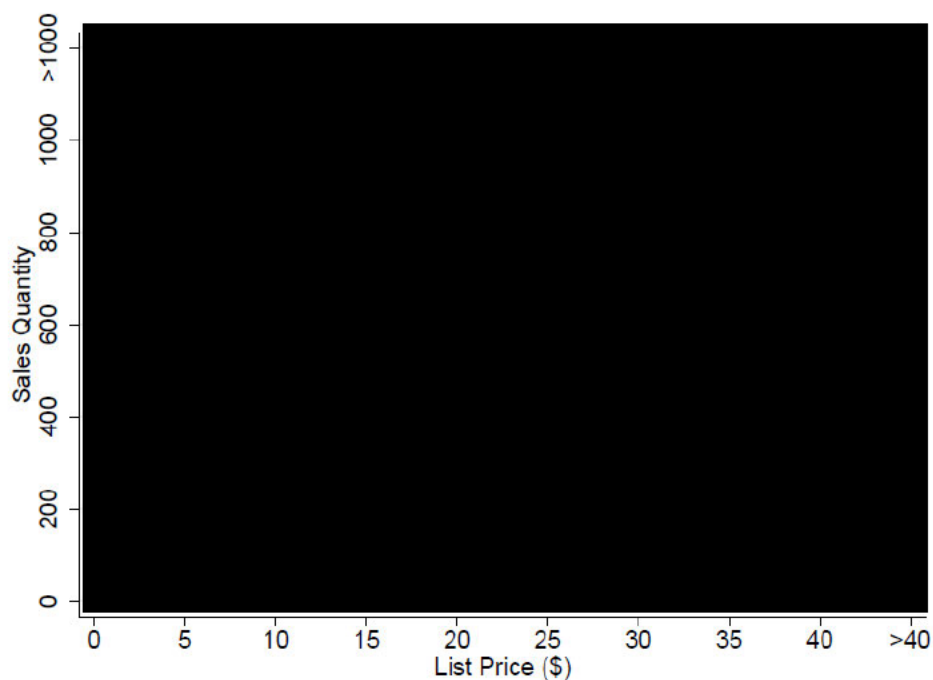
Source: See Exhibit 10a.

Figure 17.   **Prices of IAPs and Subscriptions Transacted in May 2022 – Non-Games**

Source: See Exhibit 10b.

Expert Report of Dr. Gregory K. Leonard
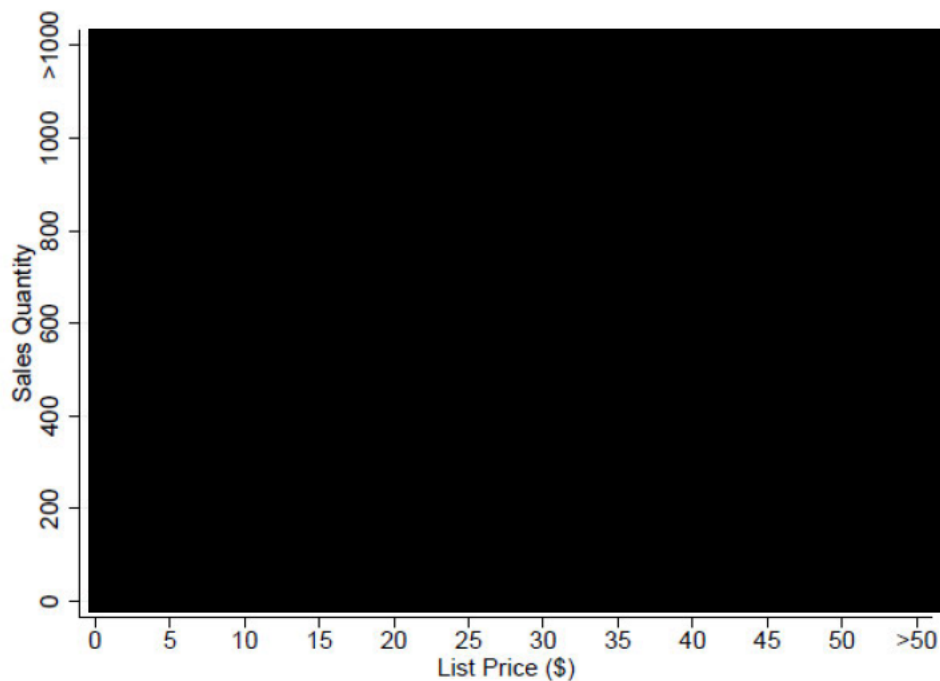
Figure 18.   Prices of Top Paid Apps in Google Play on October 30, 2022

Game Apps

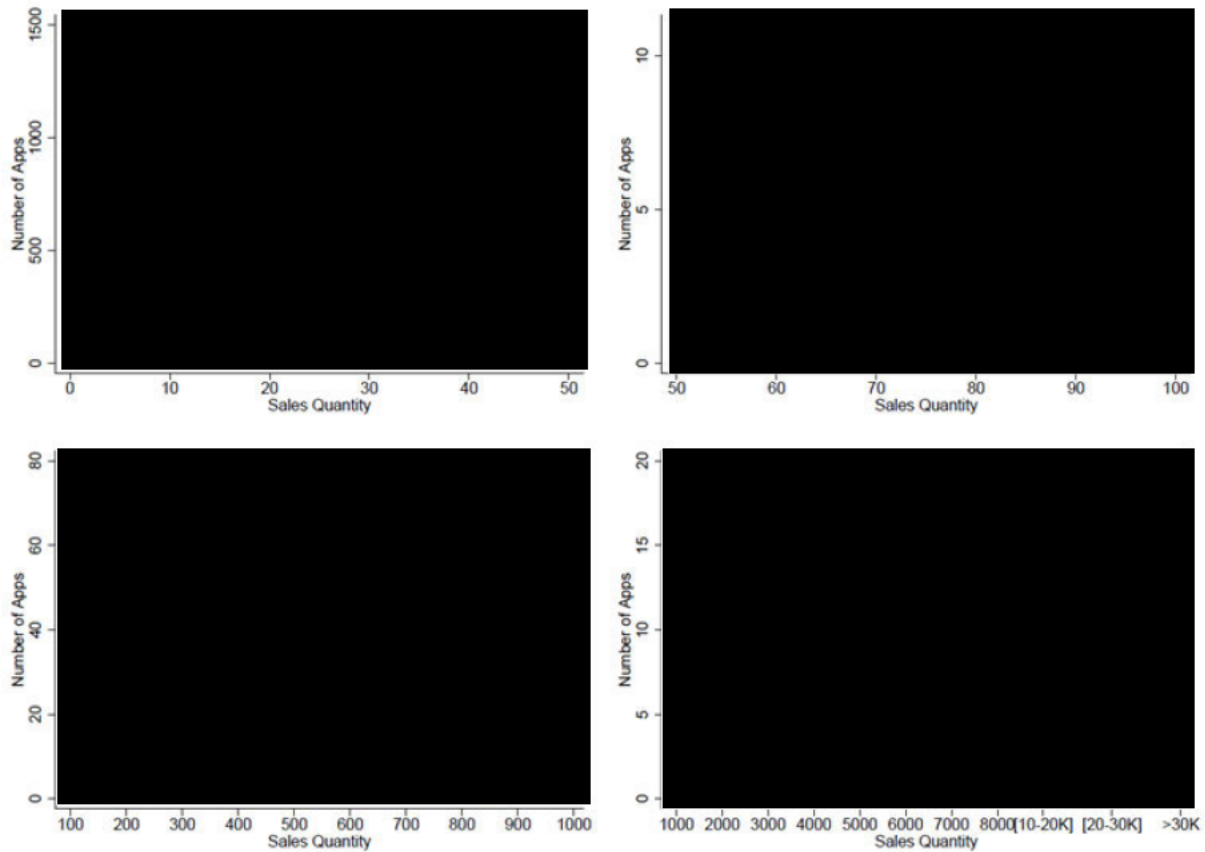**Non-Game Apps**

Source: https://play.google.com/store/apps accessed on October 30, 2022.

143.   Quantity sales also vary greatly for paid apps and IAPs and subscriptions.[182] Based on Google Play's transactions in May 2022, the monthly quantity sales of paid downloads in this month range from ▮▮▮▮▮▮ for games and ▮▮▮ for non-games. For example, in May 2022, the game app ▮▮▮▮▮▮ priced at $1.99, only had one purchase, the game app ▮▮▮▮▮▮▮ priced at $5.99, had 100 purchases, and the game app ▮▮▮▮▮▮ priced at $7.49, had 66,169 purchases. As further shown by the distribution of quantity sales in May 2022 in Figures 19 and 20, quantity sales scatter at all different values between 1 and the largest quantity sales. Again,

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[182] I look at quantity purchased of paid downloads in May 2022 using Google Play's transactions data.

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this clearly shows that there is large variation in the quantity of sales across apps, which is not consistent with "symmetry" in app quality and consumer demand.

Figure 19.   Quantity Sales of Paid Apps Transacted in May 2022 - Games

Source: See Exhibit 11a.

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Figure 20.   Quantity Sales of Paid Apps Transacted in May 2022 - Non-Games
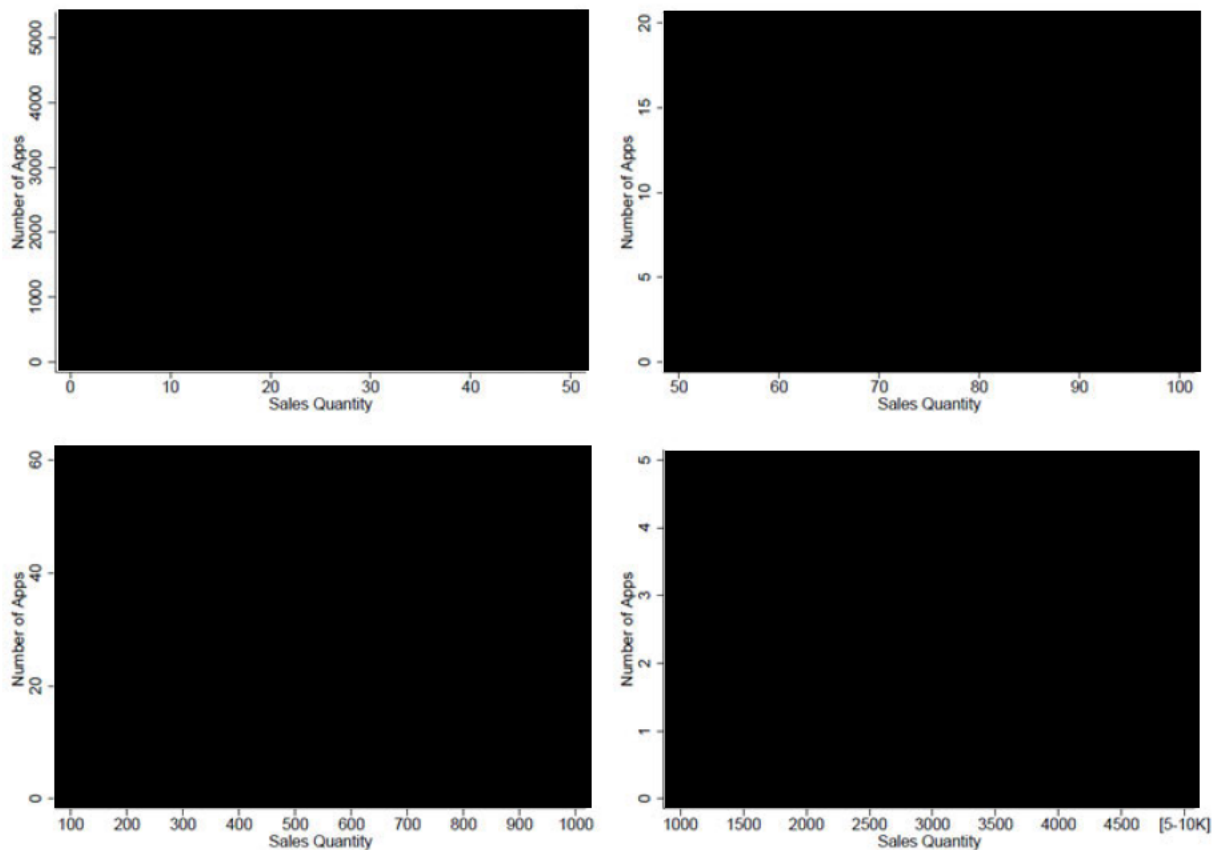
Source: See Exhibit 11b.

144.   App usage also varies greatly. Based on App Annie data, among apps with non-zero usage, the monthly hours spent on apps range from almost zero to more than 1 billion hours. For example, as shown in Figure 22, the total time spent on Facebook in September 2021 exceed ▮ hours, while the total time spent on the app "Rainbow Unicorn Secret Cook Book" (a game app for kids) are only ▮ hours, i.e., less than ▮ in total from all the U.S. users. There are also apps with zero usage. Again, this clearly shows that there is large variation in usage across apps, which is not consistent with "symmetry" in app quality and consumer demand.

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Figure 21.   Monthly Hours Spent on Apps

Source: See Exhibit 12.

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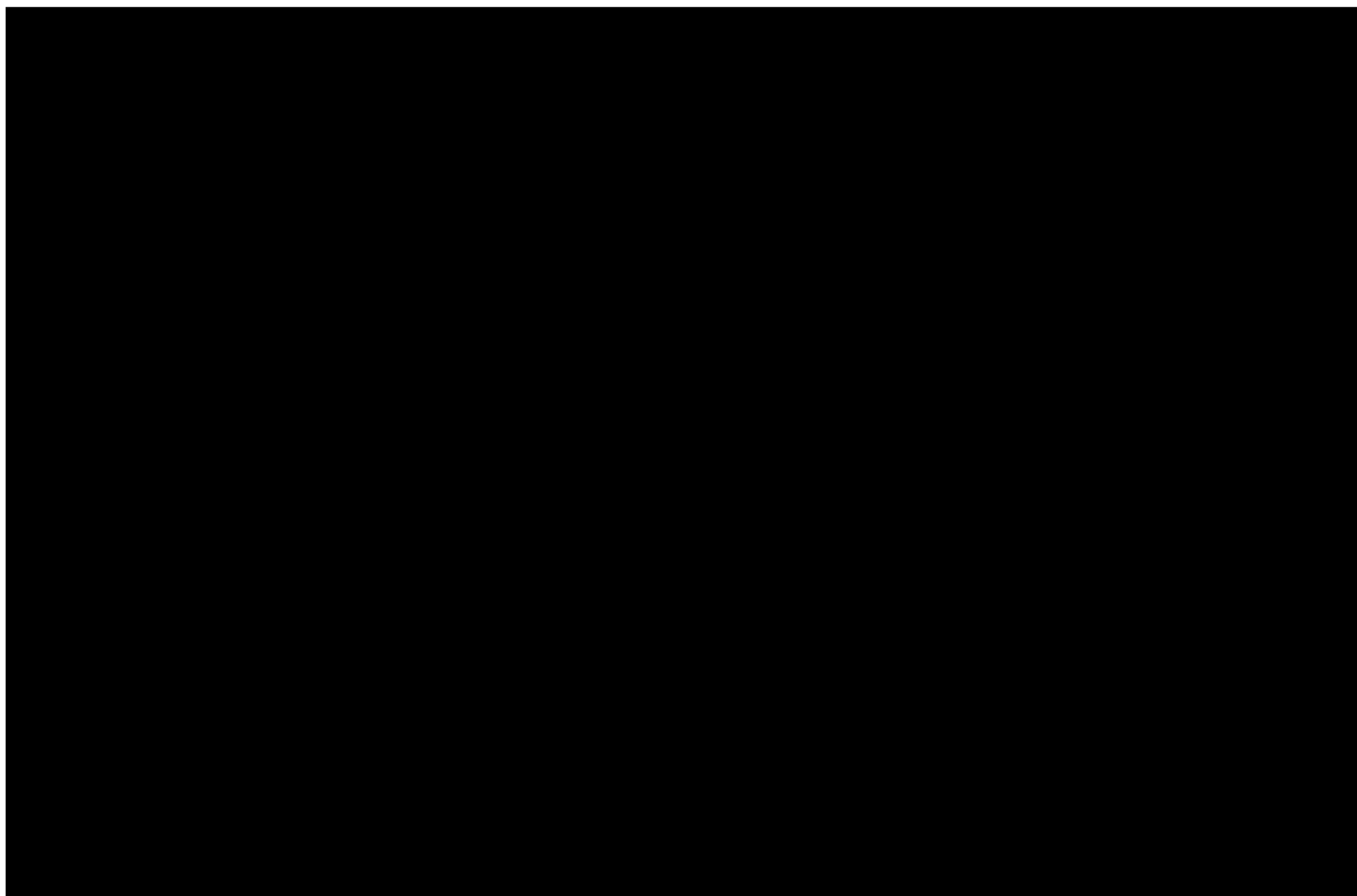
Figure 22.   Usage (Total Hours Spent) of Selected Apps in September 2021
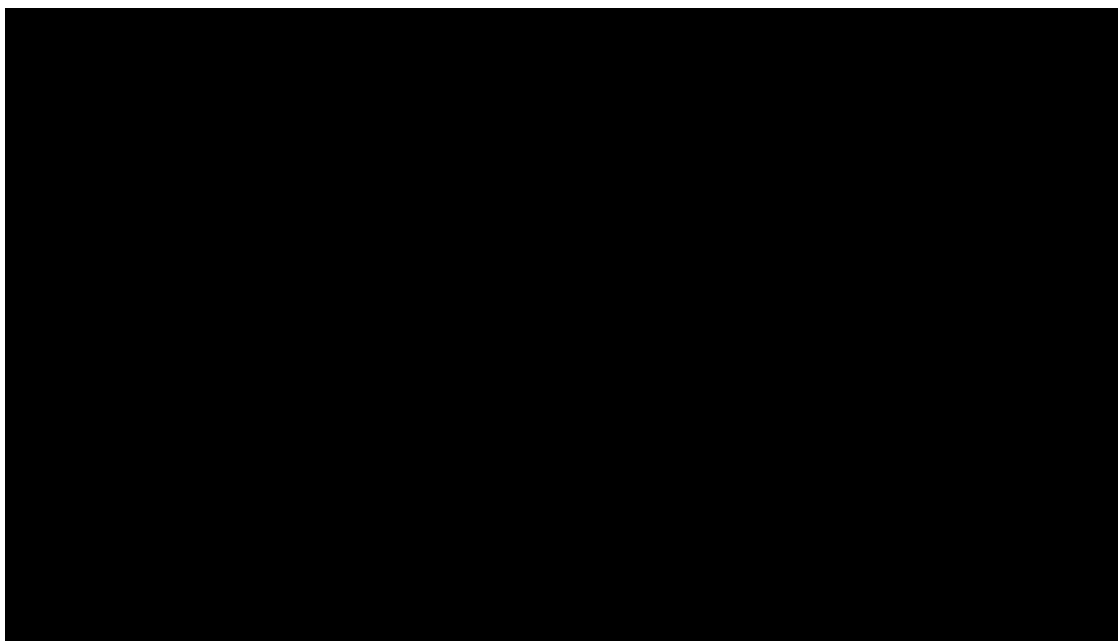
Source: See Exhibit 13.

145.   Another implication of the symmetry assumption is that, within Dr. Rysman's model, each app that offers either paid download, IAPs, or subscriptions is assumed to compete to the same degree with each of the other ▮▮▮▮ paid apps. Again, this assumption is obviously false. The economic reality is that an app competes much more closely with other apps of the same "type" than it does with apps of other types. For example, Spotify competes with other music streaming apps, but likely does not compete at all with many other types of apps, such as weather apps. In fact, studies recognize the importance of app developers being able to "effectively and efficiently identify competitor apps," which can be challenging because there are a large number of apps and they are not all competing equally which each other.[183] Many studies apply complex models to

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[183] Uddin, Kafil M., Qiang He, Jun Han, and Caslon Chua, "App Competition Matters: How to Identify Your Competitor Apps?" IEEE International Conference on Services Computing (2020), pp. 370-377.

identify competitor apps based on app characteristics.[184] Economic studies also find that highly-rated apps (or the superstar apps) differ significantly from low-rated apps in terms of app characteristics and competitiveness.[185] Finally, the economics research paper that Dr. Rysman relies upon for a key parameter of his model itself uses a demand structure that allows a given app to compete more closely with some apps than others.[186] Thus, Dr. Rysman's model is inconsistent with the source for one of its key parameters.   Accounting for product differentiation (segmentation) in apps has important implications for the effects of entry of new apps in the but-for world. Entry of a new music streaming app could have very different effects on consumers than entry of a new weather app. If Dr. Rysman's symmetry assumption were discarded, he would be forced to grapple with the difficult questions of what types of apps would enter and what effects these various new apps would have.

146.   The symmetry assumption is also false with respect to marginal costs and cost of entry. As noted above, Dr. Rysman claims certain app developer costs are marginal costs. Yet, the size of these costs vary across apps, indicating that—contrary to Dr. Rysman's assumption—not all apps

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[184] See, for example, Al-Subaihin, Afnan A., Federica Sarro, Sue Black, Licia Capra, Mark Harman, Yue Jia, and Yuanyuan Zhang, "Clustering mobile apps based on mined textual features," In Proceedings of the 10th ACM/IEEE international symposium on empirical software engineering and measurement, 2016, pp. 1-10; Chen, Ning, Steven CH Hoi, Shaohua Li, and Xiaokui Xiao, "SimApp: A framework for detecting similar mobile applications by online kernel learning," In Proceedings of the eighth ACM international conference on web search and data mining, 2015, pp. 305–314.

[185] See S. Comino, et al., "Updates management in mobile applications: iTunes versus Google Play," *Journal of Economics & Management Strategy,* 28 (2019), pp. 392-419; Lee, Gunwoong, and T. Santanam Raghu. "Determinants of mobile apps' success: Evidence from the app store market," Journal of Management Information Systems Vol. 31, No. 2, 2014, pp. 133-170; Yi, Jisu, Youseok Lee, and Sang-Hoon Kim. "Determinants of growth and decline in mobile game diffusion." Journal of Business Research Vol. 99, 2019, pp. 363-372.392-419.

[186] See Ghose, Anindya and Sang Pil Han, "Estimating Demand for Mobile Applications in the New Economy," *Management Science*, Vol. 60, No. 6, 2014, at p. 1475. Ghose and Han use the random coefficient nested logit model, where apps are grouped by different nests, i.e. app categories such as games, media, lifestyle, etc. Consumers see apps from the same nest as closer substitutes compared to the apps from other nests. Dr. Rysman, in contrast, does not account for app categories and assumes all apps are the same substitutes for each other.

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have the same marginal cost. The cost of developing an app varies by many factors, such as level of complexity, app type, and development approach. According to Net Solutions, a technology company that helps business build mobile apps and other types of digital products, the development cost in 2022 ranges from $40,000 to $60,000 for simple apps (such as a calendar app), $61,000 - $150,000 for average apps (such as McDonald's Loyalty App), and $300,000 and above for complex apps (such as Uber and Instagram).[187] The cost can also depend on the development approach – for example, the app development cost ranges from $60,000 to $75,000 with hiring a local agency, $85,000 or higher with having an in-house team, and from $10,000 to $25,000 with hiring a freelancer.[188, 189]

147.   Dr. Rysman claims that his symmetry assumption is justified because ex ante (before any app has been introduced to the market), the success of an app is uncertain and therefore all apps can be thought of as being indistinguishable.[190] While it is true that app success is ex ante less than perfectly predictable, that does not imply that all apps have the *same* level of expected success

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[187] "How Much Does it Cost to Build an App [A Complete Breakdown]," Net Solutions, October 21, 2022, https://www.netsolutions.com/insights/cost-to-build-an-app/. There are many other estimates from app development companies, technology consultancy agencies, and economics studies. For example, another source shows that the cost for developing simple apps would range from $12,960 to $30,240, from $34,560 to $60,480 for compelx apps, and from $56,160 to $82,080 for advanced apps. See Nathan Sebastian, "How Much Does It Cost to Develop an App? | GoodFirms Survey," https://www.goodfirms.co/resources/cost-to-develop-an-app. The key point is that all of these show that (1) app development cost varies widely across apps; and (2) the range include figures that are far below or above from Dr. Rysman's estimate for the fixed cost of $20,959.

[188] "How Much Does it Cost to Build an App [A Complete Breakdown]," Net Solutions, October 21, 2022, https://www.netsolutions.com/insights/cost-to-build-an-app/.

[189] Dr. Rysman's model estimates the fixed cost of entry to be approximately $21,000. This is only half the low end of the range for "simple apps" and is an order of magnitude below the low end of the range for "complex apps." Thus, this prediction of Dr. Rysman's model is inconsistent with the actual market facts.

[190] For example, Dr. Rysman tries to justify the common marginal cost assumption by resorting to this type of uncertainty, see Rysman Report ¶ 572 ("In my model, I assume that all developers have the same marginal cost c. That assumption is natural if firms set prices before learning their marginal cost. In that case, the interpretation of the marginal cost in my model is that it is an average marginal cost, which is an approximation to the reality in which developers have some uncertainty about various features of the market, including whether their app will be successful.")

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ex ante, which is what Dr. Rysman is claiming. In fact, market participants regard different apps as having different levels of expected success. For example, venture capital investors and mobile app publishers forecast the success of an app using multiple approaches and KPIs and use such forecasts to decide on the levels of funding for the app.[191] Economics studies find that success is not unpredictable – even for young entrepreneurs with limited history of success, the probability of future success is positively correlated with factors such as being funding by more experienced venture capital firms; and more experienced venture capitalists are able to identify and invest in first time entrepreneurs who are more likely to become serial entrepreneurs.[192] Additionally, game developers use knowledge of past game life cycles and game KPI data to forecast future performance and decide on marketing, development, and pricing strategy.[193] Although these forecasts are not crystal balls and are sometimes revised, they are informed by data such as franchise popularity, game genre, and pre-launch marketing and testing.[194] Moreover, economic studies also find that app success is correlated with and thus can be predicted by a variety of factors, such as the app developers' app portfolio management and past success, potential competition faced by the newly-launched apps, and app charactertistics.[195] Dr. Rysman assumes app success

[191] See, e.g., "The metrics we use to predict mobile app growth," Anna Baidachnaya, Head of Sales, Europe, Braavo Capital, December 18, 2019, available at https://www.linkedin.com/pulse/metrics-we-use-predict-mobile-app-growth-anna-baidachnaya/.

[192] Gompers, Paul, Anna Kovner, Josh Lerner, and David S. Scharfstein. "Skill vs. luck in entrepreneurship and venture capital: Evidence from serial entrepreneurs." NBER Working Paper (2006).

[193] See, e.g., "Rovio: Extensive report," *inderes*, September 6, 2022, pp. 8-18; "Capcom Announces Revision of Consolidated Full-Year Earnings Forecast," Capcom press release, April 21, 2022 .

[194] See, e.g., "Rovio: Extensive report," inderes, September 6, 2022, pp. 8-18; "Capcom Announces Revision of Consolidated Full-Year Earnings Forecast," Capcom press release, April 21, 2022.

[195] For example, Picoto et al. (2019) analyzed what factors influence the mobile app's success and found that factors such as user rating, category popularity, diversity as measured by the number of languages supported, package size, and release date are all determinants of an app's success and would increase the probability that an app will be ranked inside the top 50. Lee and Raghu (2014) provides empirical evidence to show the app developers' app portfolio management influences success in the App Store and a variety of factors app-level characteristics,

is completely unpredictable for all apps. He does not assess the robustness of his results to allowing for some predictability, likely because his model would become unworkable under this much more realistic assumption. Different levels of expected success is also demonstrated by app developers initially setting app pricing at different levels. For example, game developers view price as a function of expected value of the product, which can be inferred by factors such as developer reputation and established player base. A small game developer states that "if Jon Blow comes out with a $99 game, people would line up to buy it. If I did it, no one would buy it. Reputation plays a role here."[196] Another game developer states that "[i]t's very easy to say 'well, just price it higher', but unless you have an established fanbase that already deeply understands the value of your work, there's very little argument to make in favor of pricing your game up."[197] Economic studies also find that digital video game consumers consider high price an indicator of superior product quality and therefore higher prices are in fact associated with higher sales.[198]

148.   Moreover, the real world is dynamic, not static as in Dr. Rysman's model. Thus, in contrast to Dr. Rysman's model, a real-world app developer can adjust the prices or change monetization

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including ratings, market age, early entrant advantage, and price, also correlate with app survival on the top charts in the app store using data from Apple's App Store. Kajanan et al. (2012) shows that a variety of factors, such as number of competing apps in the same category, how many app categories an app is placed in, frequency of app updates, and promotion activities, can all be used to predict whether a newly-launched app will take off upon launch, survive, and enjoy sustained success. See Lee, Gunwoong, and T. Santanam Raghu. "Determinants of mobile apps' success: Evidence from the app store market." Journal of Management Information Systems 31, no. 2 (2014): 133-170; Kajanan, S., Pervin, N.,Ramasubbu, N.,Dutta, K., Datta, A., "Takeoff and sustained success of apps in hypercompetitive mobile platform ecosystems: An empirical analysis," International Conference on Information Systems, ICIS 2012 3: 1850-1867. Picoto, Winnie Ng, Ricardo Duarte, and Inês Pinto. "Uncovering top-ranking factors for mobile apps through a multimethod approach." *Journal of Business Research* Vol. 101, 2019, pp. 668-674.

[196]   https://www.gamesindustry.biz/indie-game-pricing-more-art-than-science.

[197]   https://www.gamesindustry.biz/indie-game-pricing-more-art-than-science.

[198]   See Choi, Hoon S., Myung S. Ko, Dawn Medlin, and Charlie Chen. "The effect of intrinsic and extrinsic quality cues of digital video games on sales: An empirical investigation." Decision Support Systems 106 (2018): 86-96.

strategies [199] for an app once success is known. By lumping paid downloads, IAPs, and subscriptions together, Dr. Rysman ignores important distinctions between them. IAPs can be added to an existing app over the app's lifecycle. The price for such IAPs will be set ex post and thus will reflect the underlying asymmetry among apps, contrary to Dr. Rysman's claim. I note that IAPs (including subscriptions) make up about ██████ of sales quantity. Moreover, many apps are follow-ups to earlier apps that allow for pricing with a better sense of expected success based on the earlier app, and many IAPs are add-ons to existing apps for which the level success is well-understood. [200]   The latter point also applies to marginal cost. Developers with prior app development experiences will have a better sense of what a new app's marginal cost will be than a first-time developer. Dr. Rysman's assumption that every app is associated with the same amount of uncertainty and that no app is distinguishable from another ex ante is inconsistent with economic reality.

149.   Dr. Rysman cited a recent unpublished working paper on the effect of the General Data Protection Regulation (GDPR) in the EU on the entry of new apps to support his position that app success is unpredictable. [201]   Specifically, the study's conclusion is based on the following empirical observation: expecting the GDPR raises the entry costs which could lead to fewer entries, the authors find that the number of ex-post successful apps that entered the Google Play store after GDPR went into effect indeed has declined but it declined by roughly the same percentage as *all*

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[199] For example, Tinder was launched as a completely free app, and only introduced a monetization strategy (subscriptions for premium content) once it was highly successful.

[200] In his theoretical model, Dr. Rysman does not distinguish between a paid download and IAPs. Yet, the ability to predict success of a new IAP for an existing app would likely be greater than for a new app in general.

[201] Rysman Report ¶ 572 ("A recent paper by Janßen et al., which uses data on apps in the Google Play store to study the effect of the General Data Protection Regulation ('GDPR') in the EU on entry of new apps and innovation, finds 'strong evidence that app success is unpredictable.'")

new apps. The authors reason that had app success been predictable, one would expect the ex-post successful apps to decline *less* than all apps as a whole Therefore, the empirical observation above suggests that app success is unpredictable.[202]

150.   There are several reasons why this study in fact does not support Dr. Rysman's extreme assumption in this case. First, the study included all apps the authors were able to collect from Google Play store, free, ad-supported, paid, subscription or IAP-based. Dr. Rysman's model, however, completely ignores free and ad-supported apps, which are the large majority of the apps in Google Play store. Because the Janßen, et al. (2022) study did not perform any targeted study on paid apps or apps with IAPs, there is no analogous evidence for the apps Dr. Rysman focused on exclusively.   Second, the authors of the study noted that their results did suggest partial predictability rather than complete unpredictability of app success and went on to assess the robustness of their findings under partial predictability.[203] In contrast, Dr. Rysman failed to assess how robust his damages calculations would be under partial predictability. Third, GDPR is a different type of market intervention than a reduction in service fee rate and therefore the findings based on GDPR do not necessarily extend to the but-for world for the Google Play store. For example, in the but-for world in this case claimed by Plaintiffs, Google would face more competition and charge lower uniform service fee rates. GDPR, however, introduced a much more uncertain environment. The study made it clear that some developers, while understanding the

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[202] Note that the authors of the study did not have the complete data on apps and their entry dates, and therefore had to perform various forms of data manipulation to circumvent data limitations. Rebecca Janßen, Reinhold Kelser, Michael E. Kummer, and Joel Waldfogel, GDPR and the Lost Generation of Innovative Apps, NBER Working Paper, May 2022 (hereafter, Janßen et al (2002)). It is also worth noting that the authors's findings are not conclusive regarding predictability. See Table 2.

[203] Janßen et al, (2022), p. 32 ("Our basic descriptive estimate provides reasonable evidence that app success is unpredictable….But the descriptive results on the decline in entry of successful apps – in columns (2) and (3) of Table 2 – Suggest partial predictability.").

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substantial cost of non-compliance, did not know what to do to comply with GDPR.[204] Thus, GDPR increased uncertainty for many developers, which was not the case with the lower service fee rates of the but-for world. Uncertainty coupled with the penalty structure of GDPR may drive out both ex-post successful and ex-post unsuccessful apps, even if app success is predictable. Because violating GDPR could result in fines to developers up to a *proportion* (4%) of annual revenue (or 20 million EUR, whichever is larger),[205] if app success is in fact predictable, uncertainty related to compliance can drive out precisely the predictably successful apps.

151.   Dr. Rysman's symmetry assumption is central to his analysis of the damages associated with the increased number of apps that he claims would have existed in the but-for world. In assuming that all apps are symmetric—both the apps that existed in the actual world and the additional apps that would have entered in the but-for world—Dr. Rysman is assuming that there is nothing special or different about the actual world apps as compared to the additional but-for apps. Specifically, under Dr. Rysman's model, any of the actual world apps could have been switched out with any of the additional but-for apps without having any effect on consumers in the actual world because of the assumption that the latter are no worse than the former as far as consumers are concerned. This assumption makes little sense in the context of the real world. In fact, one would expect that apps that did not enter in the actual world are different from the apps that did enter (i.e., the symmetry assumption is wrong). Specifically, one would expect that apps that did not enter were, on average, of lower quality, had lower expected demand, or had higher costs than the apps that did enter. In short, in the actual world the best apps entered and lower-

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[204] Janßen et al. (2022) discussed their survey answers to the questions regarding challenges and costs associated with GDPR, finding that "the three most prevalent challenges are administrative burdens (86%), additional costs (47.5%), and a lack of knowledge about the regulation's details (36.9%)." p. 45.

[205] See "Fines/Penalties," GDPR, https://gdpr-info.eu/issues/fines-penalties/.

quality apps did not. In that case, the additional but-for apps (pulled from the lower-quality apps that did not enter in the actual world) likely would offer less consumer value on average than the actual world apps, contrary to Dr. Rysman's symmetry assumption.[206] In fact, elsewhere in his report, Dr. Rysman concedes that it is possible that entry could very well have been by low quality apps and provides reasons why "concerns that only low-quality apps would enter after the reduction of commissions" are mitigated.[207] But what Dr. Rysman also failed to recognize is that low quality apps are not just those with a small but positive quality but could also include apps that are malicious. In fact, Google spent large amount of resources and money on app screening to ensure app quality.[208] Such apps that escape app stores' review would lower consumer welfare. Thus, Dr. Rysman's symmetry assumption leads to an overstatement of damages.

152.   In Appendix E, I demonstrate how incorrectly applying Dr. Rysman's symmetric model to a situation that is actually asymmetric can lead to substantial overstatements in the "variety" damages calculation.

153.   Dr. Rysman states that "[a]nalyzing or quantifying the preferences for and benefits of variety…is common in the literature."[209] Yet, the papers in the literature do not make the

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[206] For example, a higher profit app would have a lower own elasticity of demand, which in turn would generally be associated with greater consumer value (consumer surplus) than a lower profit app.

[207] Rysman Report ¶ 492.

[208] Google Play periodically removes apps which are low-quality, abandoned, violate copyright, or are potentially malicious. See, e.g., "Google to remove nearly 900,000 abandoned apps from Play Store," *Business Standard*, May 15, 2022, https://www.business-standard.com/article/companies/google-to-remove-nearly-900-000-abandoned-apps-from-play-store-122051500521_1 html; "Google removes apps for secretly copying phone numbers," *BBC News*, April 8, 2022, https://www.bbc.com/news/technology-61023379; "How Google Fights Piracy," November 2018, https://www.blog.google/documents/27/How_Google_Fights_Piracy_2018.pdf/, pp. 51-54. Google Play's content moderation investment includes Google Play Protect, which utilizes a multi-step automated and human review process to remove potentially harmful applications. "Cloud-based protections," developers.google.com/android/play-protect/cloud-based-protections.

[209] Rysman Report ¶ 561.

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unrealistic assumptions that Dr. Rysman does here. In fact, both the CES model and logit model have been criticized in the academic literature because of the restrictions they impose on the substitution patterns between products, a result of the independence of irrelevant alterantives (IIA) property that both models possess. The IIA restrictions on substitution patterns can be especially misleading in the context of new product introduction. Under a model with the IIA property, when a new product is introduced, consumers are assumed by the model to switch to the new product from incumbent products proportionally, rather than from each incumbent product depending on how similar the new product is to that incumbent product in terms of product characteristics. For example, Hausman (1996) points out this problem with the CES model in his paper on the cereal industry:

> The so-called symmetry [IIA] property seems a poor guide to empirical reality, where I know that Apple-Cinnamon Cheerios are a much closer substitute to Honey-Nut Cheerios than they are to Nabisco Shredded Wheat or to Total.[210]

154.   A more recent academic publication also discusses the shortcomings of models with the IIA property, such as the CES model, noting that the implied consumer "preferences lack flexibility because the elasticity of substitution is constant and the same across varieties."[211] Regarding Dr. Rysman's representative consumer model, Nevo (2000) states that "the required assumptions are strong and for many applications seem to be empirically false. The difference between an

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[210] Hausman, J. A. (1996). Valuation of new goods under perfect and imperfect competition. In *The economics of new goods* (pp. 207-248). University of Chicago Press.

[211] Zhelobodko, E., Kokovin, S., Parenti, M., & Thisse, J. F. (2012). Monopolistic competition: Beyond the constant elasticity of substitution. Econometrica, 80(6), 2765-2784.

aggregate model and a model that explicitly reflects individual heterogeneity can have profound

affects on economic and policy conclusions."[212]

> **d. Dr. Rysman's Model Predicts That There Would Be a Large Number of Additional Apps in the But-For World, But Dr. Rysman is Unable to Identify Any Specific App or Developer That Was Inhibited From Developing Such an App**
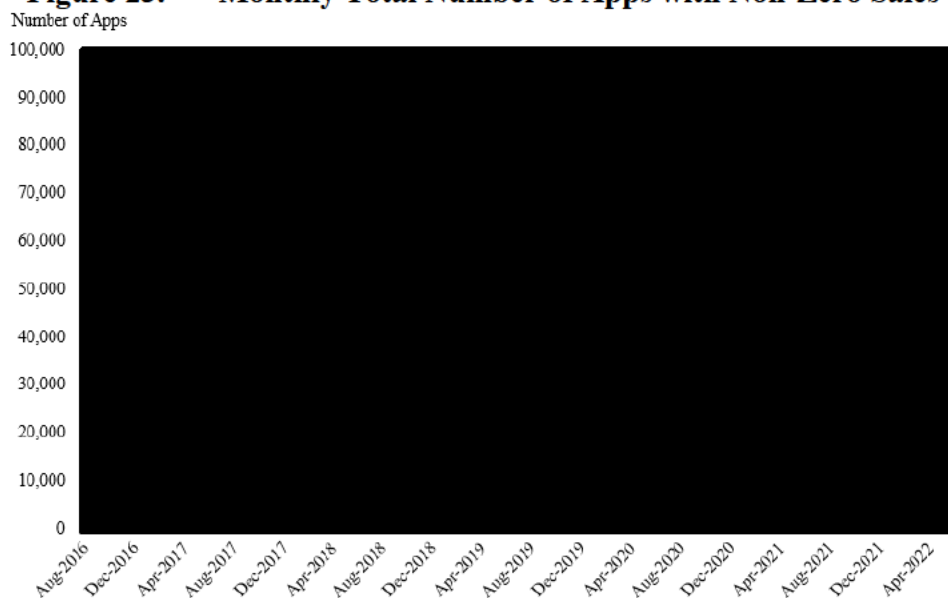
155.   For Dr. Rysman's variety damages calculation (where zero pass-through to consumer

prices is assumed), Dr. Rysman's model predicts that there would have been 338,993 more apps

that offer paid downloads, IAPs, or susbcrptions in the but-for world than in the actual world, a

72.9% increase in the number of such apps. According to Dr. Rysman, this leads to about ███

█████████████ damages for consumers in the Plaintiffs states during the class period.[213]

156.   Dr. Rysman does not describe what these apps would have been or which developers would

have created them. He provides no evidence that there was a pent-up supply of apps that would

have been released if only the service fee rate had been 15% instead of 30%. He has no evidence

from any developer about if and to what extent the service fee plays a role in entry decisions. In

fact, after the July 2021 Google Play service fee rate reduction, there was no observable spike in

either the number or the growth rate of apps that offer paid downloads, IAPs, or subscriptions and

incurred sales (based on Google Play's transactions data). See Figures 23-24.

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[212] Nevo, A. (2000). A practitioner's guide to estimation of random-coefficients logit models of demand. Journal of economics & management strategy, 9(4), 513-548, p 515.
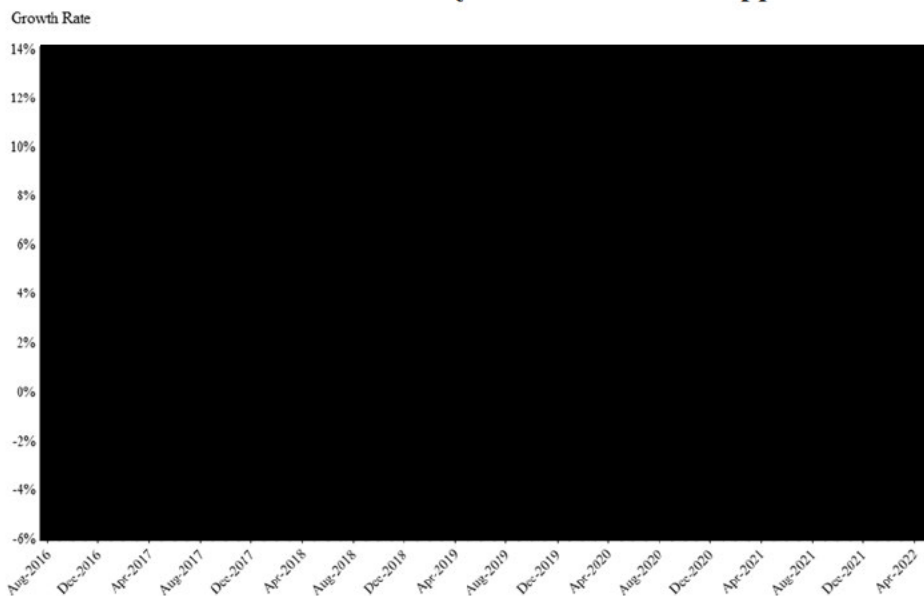
[213] Rysman Report Exhibit 74.

Figure 23.   Monthly Total Number of Apps with Non-Zero Sales

Source: See Exhibit 15a.

Figure 24.   Growth Rate of the Monthly Total Number of Apps with Non-Zero Sales

Source: See Exhibit 15b.

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D.   Dr. Rysman's Hybrid Overcharge/Variety Damages Calculation is Flawed and Unsupported

157.   Dr. Rysman performs a hybrid calculation that allows both the service fee rate and the number of apps to be different in the but-for world than in the actual world. He again assumes a 15% but-for service fee rate and uses his theoretical model (which builds in a 100% pass-through rate) to calculate damages that combine effects from increased variety and lower consumer prices in the but-for world. Because this calculation effectively uses the same inputs and approaches as Dr. Rysman's overcharge and variety damages calculations, it suffers from the same flaws and is unsupported for the same reasons as those discussed above.

VIII.   DR. RYSMAN AND DR. SINGER IGNORE INCREASED COSTS TO CONSUMERS AND DEVELOPERS IN THE BUT-FOR WORLD

158.   Dr. Rysman claims that, in the but-for world, there would have been many more paid apps and potentially more app stores and these additional paid apps would have led to a substantial increase in consumer welfare. Using his highly stylized model, he quantifies the loss in consumer welfare due to this "variety effect." Dr. Singer similarly argues that there would be additional app stores that compete against Google in the but-for world and quantifies (1) the effect of an allegedly lower Google Play store service fee rate on the prices and the quantity purchased and (2) the additional consumer subsidies that Google Play store would have offered. In all of these damages claims, both Dr. Rysman and Dr. Singer assume that Google Play is the only market player who would have changed its business conduct leading to unambiguous effect on consumers. Their assumption fails to properly take into account the distinct possibility that both consumers and developers would have faced increased costs in the but-for world. The impact of increased costs on consumer welfare, which I discuss in detail below, is intuitively clear. For developers, under Dr. Rysman's damages theory, the increased costs would have reduced entries/new apps in the

but-for world, directly countervailing Dr. Rsyman's variety effect. Neither Dr. Rysman nor Dr. Singer properly considered these additional costs, which led them to overstate the damages.

159. First, consider the consumers. In both Dr. Singer's and Dr. Rysman's but-for world where there would have been many more paid apps and more app stores, one would expect that consumers would have had to spend more time searching to identify the set of apps to download to their phones. Economic studies have shown that consumers face search cost when using smartphones to find apps. For example, Ghose, Goldfarb, and Han (2013) find that smaller screen size of mobile phones increases cost to user of browsing for information; furthermore, they find that ranking effects are higher on mobile phones, which suggest that search cost is higher on mobile phones, for example, links that appear at the top of the screen are especially likely to be clicked on mobile phones and stores located in close proximity to a user's home are much more likely to be clicked.[214] Lee et. al. (2020) states that "[t]he mobile applications (apps) market is one of the most successful software markets. As the platform grows rapidly, with millions of apps and billions of users, search costs are increasing tremendously."[215] These increased search costs in the but-for world would be an offset to damages. Yet, Dr. Rysman's model, as well as Dr. Singer's, assumes consumers have perfect information about every app in the market and that search is costless for consumers and thus entirely ignores this offset, thereby overstating damages. The existence of consumer search costs can also reduce the service fee pass-through rate, see Appendix E.

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[214] Ghose, Anindya, Avi Goldfarb, and Sang Pil Han, "How is the mobile Internet different? Search costs and local activities." *Information Systems Research* Vol. 24, No. 3, 2013, pp. 613-631.

[215] Lee, Gene Moo, Shu He, Joowon Lee, and Andrew B. Whinston. "Matching mobile applications for cross-promotion." Information Systems Research 31, no. 3 (2020): 865-891.

160.   Dr. Rysman also ignores that many apps exhibit direct network effects—the value of the app to a consumer increases with the number of other consumers that use the app. Examples are dating apps and certain games. In Dr. Rysman's but-for world where there would have been more apps, the number of consumers using each app that existed in the actual world could have been lower than in the actual world. For apps that exhibit direct network effects, these apps would have delivered less value to consumers in the but-for world than the actual world. This reduction in value would be an offset to Dr. Rysman's "variety" damages. See Appendix E.

161.   Now, consider the developers. Developers who would have multi-homed in the but-for world would have incurred additional costs related to separate app store applications, negotiations, different compliance requirements, different versions of Android systems (especially if that means different programming languages or substantively different versions of the same programming languages need to be used), among others. Based on Dr. Rysman's theory, these additional costs would have led to less entry (because it would be more costly for developers) and thus less "variety" than in Dr. Rysman's but-for world.[216] By ignoring the increased costs for developers in the but-for world, Dr. Rysman overstates the "variety" effect. While Dr. Rysman acknowledges the additional "technical barriers and financial requirements" developers would have had faced in the but-for world when multi-homing, he downplays the significance of these costs and argues that developers would have strong incentive to multi-home and in fact would have done so.[217]

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[216] As the article that Dr. Rysman cited argues, "[f]actors reducing entry costs deliver large welfare benefits, while factors hindering entry – such as GDPR – can deliver substantial welfare losses." Janßen et al. (2002), p. 37.

[217] Rysman Report ¶ 158 ("Nonetheless, I find that technical barriers and financial requirements would not inhibit developers from multihoming. While there are some technical barriers to making Android apps available on different distribution channels, the 'similarities in the source code between different Android Os' means it is relatively easy for developers to modify an app to ensure its functionality on various Android smart mobile devices. While developers may also need to pay a fee for every additional app store on which they publish their app, such one-time fees are modest or even free. For example, the Google Play Store charges a one-time

According to both Dr. Rysman and Dr. Singer, so would consumers, presumably due to alternative stores being "side by side" on the home screen of mobile devices and developers' setting lower prices on alternative stores.[218] Lack of actual evidence of consumer multi-homing in the but-for world, Dr. Rysman and Dr. Singer cannot rule out that many consumers would still have chosen to single home even in the but-for world (for example, due to consumer search costs discussed above). In such a but-for world, there would not have been a single app store where a developer could reach all consumers. Consequently, even according to Dr. Rysman, it is important for developers to multi-home because "[e]conomic theory suggests that the incentives for agencts on one side to multi-home are inversely related to the measure of agents who multi-home on the other side of a platform"[219] and therefore, "[a]pp developers want to reach as many device users as possible… Multi-homing is especially important for apps that facilitate interactions among users, such as apps with a social networks component."[220] In other words, Dr. Rysman's arguments support the conclusion that additional costs due to the strong incentive to multi-home would be

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developer fee of USD $25, while the Samsung Galaxy Store is free of charge for developers."). Note that Dr. Rysman considered only a subset of incremental costs. They are also based on the actual world. He does not explain why one would expect the same in the but-for world. See also Rysman Report ¶ 159 ("Therefore, I find that, in the world absent Google's challenged restrictions, developers would be more incentivized to distribute their apps via alternative distribution methods that offer them a higher share of the revenues on app sales and in-app purchases and to multi-home across several distribution methods.")

[218] Singer Report ¶ 176 ("A developer can take advantage of multi-homing by discounting the price of its Apps to "steer" consumers to use the lower-cost platform.") and ¶ 283 ("In the context of this case, multi-homing exists to the extent consumers have App stores side-by-side on their mobile phone's home screens (if Google's conduct did not prevent consumers from having multiple App stores)—the adjacent placement is necessary so that multihoming is equally convenient for consumers. When two platforms are sufficiently close substitutes in the eyes of buyers and sellers, multi-homing can lead to competitive outcomes that benefit both buyers and sellers."). Rysman Report ¶ 159 ("Finally, given the likelihood that consumers use multiple distribution channels, developers would have a further incentive to actively promote the distribution of their apps via alternative platforms (or via sideloading), for example by offering lower prices for their apps or its in-app content to their consumers.") Dr. Rysman does not quantify "the likelihood that consumers use multiple distribution channels."

[219] Rysman Report Fn 61.

[220] Rysman Report ¶ 192.

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inevitable. By failing to take into account these incremental costs, Dr. Rysman overstates his variety damages.[221]

IX.   THE PLATFORMS IDENTIFIED BY DR. SINGER AND DR. RYMAN ARE UNSPPORTED BENCHMARKS FOR GOOGLE PLAY'S BUT-FOR SERVICE FEE RATE

162.   Both Drs. Singer and Rysman tried to justify their but-for service fee rates by comparing them to various "benchmarks." However, a prerequisite for a valid benchmark analysis is that the potential benchmark is similar in its economic characteristics to the "target." The service fee rate that a two-sided platform charges depends on a number of economic characteristics such as the demand elasticities on both sides, the user installed base (reflecting indirect network effects), and competitive conditions.[222] Neither Dr. Singer nor Dr. Rysman present any evidence that their claimed benchmarks are appropriate or informative for Google Play. For easy reference, Table 9 shows the benchmarks that Drs. Singer and Rysman proposed.

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[221] Dr. Singer responded to a similar critique in his Class Rebuttal Report. First, as noted above, he argues that developers do not need to multi-home to benefit from increased competition. Singer Class Rebuttal Report ¶¶ 62-63 ("the mere threat of developers defecting to a competing platform, combined with actual defection (and steering) by other developers, would spur Google to decrease its take rate, in order to keep as many developers as possible on its platform.") Then, like Dr. Rysman, he argues that Dr. Burtis "provides no evidence that the incremental benefits of substantially and permanently lower take rates would be eliminated by the (presumably modest) incremental costs associated with operating on multiple app stores (all of which would be Android-compatible). Therefor, Dr. Singer appears to acknowledge that such incremental cost may exist but disputes its significance. While certain developers may be content with single homing, Dr. Singer cannot rule out that some will have to incur additional costs, especially in a but-for world where customers single home. Neither Dr. Singer nor Dr. Rysman rule out such a but-for world. Despite claiming such costs are "presumably small," Dr. Singer presented no evidence to that effect.

[222] Rochet and Tirole (2003); Rochet, Jean-Charles, and Jean Tirole , "Two-Sided Markets: A Progress Report," *The RAND Journal of Economics*, Vol. 37, No. 3, 2006, pp. 645-667; Hagiu, Andrei, "Pricing and commitment by two-sided platforms," *The RAND Journal of Economics*, Vol. 37, No. 3, 2006, pp. 720-737.

Table 9.   Benchmarks Proposed by Drs. Singer and Rysman

Category	Benchmark	Service Fee Rate	Proposed by Dr. Singer	Proposed by Dr. Rysman
Alternative Android App Stores	ONE Store	5-20%	Yes	Yes
	Aptoide	10-25%	Yes	Yes
	Amazon Appstore	18%	Yes	Yes
	Galaxy Store	30%	No	Yes
	Game Jolt Store (Mobile)	0 to 10%	No	Yes
PC App Stores	Microsoft	5% for non-game and non-Xbox apps 0% for non-game PC apps if apps utilize its own or a 3P payment system	Yes	Yes
	Chrome Web Store	5% if using Chrome Web Store API 30% for in-app payments for ARC apps	Yes	Yes
	Game Jolt Store	0-10%	No	Yes
PC Game Platforms	Microsoft (Game)	12% for PC games 30% for Xbox console games [1]	Yes	Yes
	Steam	20-30%	Yes	Yes
	Epic Games Store	12% for all games	Yes	Yes
	Discord	10%	Yes	Yes
Other Two-Sided Platforms	Substack (Online publishing platform)	10% + credit card fee	Yes	No
	Revue (Online publishing platform)	5%	Yes	No
	Amazon	8%-15% + $0.99/item or $39.99/month	Yes	No
	eBay	12.55% + $0.35	Yes	No
	Etsy	8% + $0.45	Yes	No

Source: See Exhibit 16.

163.   Dr. Singer argues that his claimed but-for Google Play service fee rate of 22.2% generated by his app distribution market model is corroborated by "similarly situated, two-sided digital platforms." By "similarly situated" platforms, Dr. Singer appears to refer to those platforms "where there are no (or fewer) anticompetitive restraints similar to those imposed by Google in the instant case, and the fundamentals of platform economics (connecting two sides of a market) are present."[223] Dr. Singer provides a list of platforms including ONE Store in Korea, Aptoide,

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[223] Singer Report ¶ 307.

Amazon Appstore, Steam, Epic, Microsoft, PC App store, online retail stores, and even online publishing.   The two conditions Dr. Singer identifies (no anticompetitive restraints and, generically, being a platform) are hardly sufficient to ensure comparability, as different platforms can vary widely in their supply and demand characteristics.   Therefore, Dr. Singer has failed to demonstrate that any of these platforms are "similarly situated" to Google Play along any supply and demand dimension (other than the mere fact of being platforms).   To the contrary, there are many reasons that suggest that these other platforms are not appropriate benchmarks for Google Play in the but-for world.   To be clear, assessing the comparability of these other platforms with Google Play is a distinct exercise from defining the relevant antitrust market in which Google Play store participates.   Two products can participate in the same antitrust market and yet one product's price, profit margin, share, or other outcome measure may not be an appropriate benchmark for the other's.   For example, a higher quality product may be in the same relevant antitrust market as a lower quality product; yet, the price of the lower quality product generally would not be a sound benchmark for the price of the higher quality product (or vice-versa) precisely because of the quality difference, which would, in general, create both supply-side and demand-side differences between the two products.

164.   Dr. Rysman compares his but-for Google Play service fee rate of 15% to a largely overlapping but smaller set of claimed benchmarks than Dr. Singer.   It is unclear if that reflects Dr. Rysman's disagreement with Dr. Singer or Dr. Rysman simply failing to consider the additional stores Dr. Singer claimed are benchmarks.   Specifically, Dr. Rysman consideres only PC app stores and alternative Android App stores.   He tries to justify the comparison with PC app stores by simply noting that "Google itself considers PC app stores as a 'competitive benchmark'."   Dr. Rysman offers no independent assessment and assumes that the phrase "competitive

benchmark" used in the internal presentation has exactly the same meaning as an economist assigns to that term.[224] In particular, the Google internal documents do not state that the rates charged by PC app stores represent rates that, without any adjustment, would have been appropriate for Google Play in the but-for world in this case. Rather, one could also interpret the documents to be making the simpler point that PC app stores are competitors to Google Play and then indicating what rates those stores charge. In that case, the PC app store rates could not be deemed appropriate benchmarks for the but-for world in this case without further analysis. With regard to the alternative Android app stores, Dr. Rysman does not even try to justify the comparison. Curiously, when making the comparison, Dr. Rysman emphasizes that the service fee rates on the PC app stores "are bounded above by Google's service fee of 30 percent and the lower service fees are in-line with the service fees that Google has offered to various price sensitive developers over time" and the service fee rates on alternative Android App stores "are generally below 30 percent, which provides yet another indication that mobile app stores are able and willing to decrease their commissions below 30%."[225] He does not claim that the fees charged by any of the alternative app stores support his uniform 15% but-for service fee rate. To the contrary, given that several stores in Dr. Rysman's list charge 30% for at least certain transactions, Google Play's 30% service fee rate is within the range that Dr. Rysman apparently finds "competitive."

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[224] Indeed, the internal presentations cited by Dr. Rysman ███████████████████████████ ██ See Google, "Play Business Model Thoughts," GOOG-PLAY-000565541.R-562.R, at 558.R ███████████████████████████████████); Google, ██████████████████████████ March, 2019, GOOG-PLAY-000542516.R-535.R, at 529.R-530.R. █████████████████████████████ █████████████).

[225] Rysman Report ¶ 478.

165.   There are many reasons why these other platforms are not appropriate benchmarks for Google Play store in the but-for world.

166.   None of the app stores Drs. Singer or Rysman identifies has a user installed base comparable to that of Google Play even in Dr. Singer's but-for world where Google Play retains a 60% share.   Steam's gaming app library is ▮▮ of the size of Google Play's gaming app library; the Epic Games Store, Microsoft Store, and Game Jolt Store are even smaller.[226]   The Amazon Appstore is about ▮▮ (in first quarter to 2021) to ▮▮ (in 2017) of Google Play, and the Samsung Galaxy store is about ▮▮▮ (in 2017) of Google Play.[227]   The economics literature demonstrates that installed base is an important determinant of fees charged by a two-sided platform.[228]

167.   Google had and would still have had the first-mover advantage in the but-for world; none of the platforms Dr. Singer and Dr. Rysman considered would have replaced Google as the first mover.   Dr. Singer agrees and Dr. Rysman does not claim otherwise.[229]   Relatedly, Dr. Singer ignores the dynamic nature of service fee rate setting.   For example, pricing by a new entrant can change over time as the entrant and the marketplace mature.   Such changes may be due to consumers better understanding the value proposition over time and the emergence of other competitors, among others.   Indeed, Microsoft charged a 30% service fee on game apps up until Aug 2021, most of the alleged damages period.   Dr. Singer cites only the more recent service fee rates charged by these other stores and improperly ignores that these same "benchmarks" charged

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[226] Rysman Report ¶ 204; Rysman Report Appendix G.

[227] Rysman Report ¶¶ 150, 312.

[228] See Mark Armstrong, "Competition in Two-Sided Markets," *RAND J. ECON.*, 2006, pp. 668-691.

[229] Singer Class Rebuttal Report ¶ 40 ("In addition, as the distributor of the initial application and the owner of the Android operating system, Google would have an incumbency advantage, providing with a continued economic incentive to distribute as many applications as possible.")

higher service fee rates at earlier points in time. Dr. Singer provides no basis to rule out the earlier, higher rates as the better indications for what the but-for Google Play service fee rate would have been. Dr. Rysman, on the other hand, emphasizes the importance of competitive dynamics. He discusses how multiple app stores lowered service fees over time which he argued were their responses to competitive pressure. However, while Dr. Rysman also discusses how Microsoft Store initially set a commission rate of 30% and lowered it only in 2021, he chose not to show Microsoft Store's 30% commission rate prior to 2021 in his Exhibit 68.[230]

168.   Furthermore, Dr. Singer argues that many stores, especially Android app distributors like Amazon and Aptoide, were disadvantaged by Google's anticompetitive conduct in the actual world and therefore, could not effectively compete. Because pricing is affected by the competitive landscape, it could very well have been that in response to the alleged disadvantages, Amazon and Aptoide lowered their service fee rates in the actual world below what they would have charged in the but-for world. In that case, the Amazon and Aptoide service fee rates in the actual world would be too low to serve as reliable benchmarks for the Google Play service fee rate in the but-for world.

169.   Both Dr. Singer and Dr. Rysman ignore two-sided platforms that charge 30% or close to 30% service fee rates, with no explanation given. For an unbiased assessment, Dr. Singer and Dr. Rysman need to show why their low service rate platforms are more comparable to Google Play store than other platforms charging 30% or nearly 30% service fee rates. They do not do so. This is particularly puzzling given that Dr. Singer went far afield, claiming benchmarks in industries outside of app stores, including online retail and online publishing.   For example, as I discuss

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[230] Rysman Report Exhibit 68.

below, app stores in China often charge more than 30% while none has a market share anywhere

close to 60%.   Table 10 below shows some of the platforms charging rates more comparable to

and sometimes even higher than Google Play's 30% service fee rate.

Table 10.   Benchmarks Proposed by Drs. Singer and Rysman

Platform Type	Platform	Service Fee Rate	Notes
Game Console Store	Microsoft Store for Xbox	30%	15% for non-video game subscriptions. 15% for non-Xbox purchases (except certain Business, Education, and Games apps on Windows 8).
	Nintendo E-Shop	30%	
	PlayStation Store	30%	
PC Gaming Store	Steam	30%	25% for sales between $10 million and $50 million. 20% for sales greater than $50 million.
Mobile App Store	Samsung Galaxy Store	30%	
	Amazon Appstore	30%	20% for app developers with less than $1 million in app revenue, plus 10% of revenue as credit for AWS.
Book and Audiobook Publishing	Audible-ACX	60% or 75%	Commission rates are increased for audiobooks which are not exclusively distributed.
	Kindle Direct Publishing	30% or 65%	Kindle Direct publishers may choose between a "35% Royalty Option" and a "70% Royalty Option."

Source: See Exhibit 17.

170.   Dr. Singer's and Dr. Rysman's claimed benchmarks are further flawed. Many stores that

they argue are appropriate benchmarks charge a hybrid rate (i.e., different rates on different types

of transactions). Neither Dr. Singer nor Dr. Rysman report the effective service fee rate for any of

them. Therefore, they could not rule out the possibility that the effective rates are much closer to

30% than the but-for rates that Dr. Rysman uses for Google Play in the but-for world.

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171.   Lastly, except for the Epic Game Store, a highly specialized app store for games, which has a much smaller user base and charges a uniform 12% service fee rate, none of the stores Dr. Singer and Dr. Rysman claim to be comparable charges a uniform rate across the board.   Yet, Dr. Rysman claims that Google Play store, which still would have had a significant share in Dr. Singer's but-for world, would have been the only other store that charges a uniform 15% service fee rate, a rate that would have been below almost every other store.   This makes no economic sense.

X.   CONSUMERS – DISGORGEMENT AND RESTITUTION CALCULATIONS

A.   Overview of Mr. Solomon's Disgorgement and Restitution Calculations

172.   Mr. Solomon calculates disgorgement as the difference between Google Play's actual and but-for incremental profits, where the actual incremental profits are calculated using Google's P&Ls,[231] and the but-for incremental profits are calculated using inputs from Dr. Singer's and Dr. Rysman's damages models and Google's P&Ls.[232]

173.   Specifically, Mr. Solomon calculates the but-for revenue as the sum of [1] the but-for app revenue and [2] the but-for non-app revenue, and the but-for cost as the sum of [3] the but-for app cost and [4] the but-for non-app cost. That is, the but-for incremental profits are calculated as [1] + [2] - [3] - [4], with each term calculated as follows:

- [1] The but-for app revenue is calculated using inputs from Singer's and Rysman's damages models:

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[231] See Solomon Report ¶¶ 75 - 83.

[232] See Solomon Report ¶¶ 84 - 130. Mr. Solomon allocated disgorgement and restitution damages to the US and the 39 States based on revenue shares of US and the 39 States relative to worldwide.

- **Singer's take rate models:** Mr. Solomon uses three parameters from Dr. Singer's app/in-app take rate model[233] and the single take rate model[234]: [a] the price effect, i.e., the percentage change in Google's revenue per transaction; [b] the quantity effect, i.e., the percentage change in the number of transactions in the market in response to the price changes of paid apps and IAPs from changes in the service fee rate passed through to app prices; and [c] Google Play's but-for market share, i.e., 60%. He then calculated the but-for app revenue as Google Play's actual net app revenue * (1 - [a]) * (1 + [b]) * 60%.

- **Singer's discount model:** Mr. Solomon similarly uses three parameters from Dr. Singer's discount model: [a] the price effect, i.e., the increase in the dollar amount of discounts Google provided to consumers as a percentage of actual net consumer app price; [b] the quantity effect, i.e., the percentage change in the number of transactions in the market in response to the price changes of paid apps and IAPs from changes in Google discounts; and [c] Google Play's but-for market share, i.e., 60%.[235] He then calculates the but-for app revenue as (Google Play's actual net app revenue – actual net consumer spend incurred in the Google Play store * [a]) * (1 + [b]) * 60%.

- **Singer's Amazon discount model:** Mr. Solomon also uses Dr. Singer's Amazon discount model to obtain [a] the price effect, i.e., the increase in the dollar amount of discounts Google provided to consumers as the difference between Amazon Appstore's ██████ consumer subsidy and Play Store's actual ██████ consumer subsidy. He calculates the but-for app revenue as (Google Play's actual net app revenue – actual net consumer spend incurred in the Google Play store * [a]).[236]

- **Dr. Rysman's pooled and IAP models:** Mr. Solomon simply applies the but-for service fee rate in Dr. Rysman's pooled model for a single market for in-app transactions and paid downloads (i.e., 15% for both types of transactions) and the IAP market model (i.e., 15% for IAPs and the actual service fee rate of 30% for paid downloads) to calculate the but-for app revenue as the actual net consumer spend of IAPs and paid downloads incurred in the Google Play store multiplied respectively by their assumed but-for service fee rates.

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[233] See Solomon Report ¶¶ 87 - 89.

[234] See Solomon Report ¶¶ 113 - 114.

[235] See Solomon Report ¶¶ 103 - 105.

[236] See Solomon Report ¶¶ 108 - 110.

- [2] The but-for non-app revenue is assumed to be same as the actual non-app revenue.[237]

- [3] The but-for app cost is calculated as the but-for app revenue multiplied by one minus the actual Google Play operating profit margin for apps.[238]

- [4] The but-for non-app cost is assumed to be the same as the actual non-app cost.[239]

174.   Mr. Solomon also calculates two types of consumer restitution - the profit-based restitution and the revenue-based restitution.[240] He calculates the profit-based restitution as the difference between Google Play's actual and but-for incremental profits multiplied by the pass-through rate. The but-for incremental profits are calculated as the sum of the but-for app revenue and the but-for non-app revenue, minus the sum of the but-for app cost and the but-for non-app cost, where the but-for app revenue is calculated using inputs for the percentage change in Google's revenue per transaction, i.e., the price effects (without considering the percentage change in the number of transactions in the market in response to the price changes of paid apps and IAPs, i.e., the quantity effect) from Dr. Singer's app/in-app take rate model, the single take rate model, and the discount models (the discount model and the Amazon discount model), as well as the pass-through rate estimated by Dr. Singer. The price effect inputs are calculated in the same way as in the disgorgement calculations. The input for the pass-through rate is 91.1% in the take rate models and 100% in the discount models. Mr. Solomon calculates the revenue-based restitution as the

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[237] See Solomon Report ¶ 90.

[238] See Solomon Report ¶ 95.

[239] See Solomon Report ¶ 91.

[240] See Solomon Report ¶ 19.

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difference between Google Play's actual and but-for revenue multiplied by the same set of pass-through rate inputs.[241]

B.   Critiques of Mr. Solomon's Calculations

175.   Since Mr. Solomon's disgorgement and restitution calculations essentially rely on estimates from Drs. Singer and Ryman's damages models, his calculations suffer the same flaws as Drs. Singer and Ryman's damages models.[242]

176.   There is one additional conceptual problem with Mr. Solomon's disgorgement calculation. The "ill-gotten profits" from a platform's exclusionary conduct in general derive from a number of sources, including the entities on different sides of the firm's platform (such as consumers and developers in the present case) and rival platforms (such as competing app stores in the present case). For example, the firm's conduct may have increased its profits by taking share from rivals and being able to charge higher prices to entities on the various sides of its platform. From an economics point of view, when a particular group, say, consumers, brings a litigation, that group should be entitled only to a *portion* of the "ill-gotten profits" that reflects the relative antitrust harm it sustained compared to other groups. Otherwise—if each group was entitled to claim the *entire* "ill-gotten profits" for itself—there would necessarily be multiple recovery of the same "ill-gotten profits." Thus, a disgorgement calculation should (from an economics viewpoint) apportion the total "ill-gotten profits" among the various claimants, with each claimant entitled only to its

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[241] The but-for app revenue here also only considers the effect of "reduction in (platform) pricing" and does not consider any quantity effect.

[242] In Sections XI. E and XI. F, I replace the inputs that Mr. Solomon takes from Drs. Singer and Rysman, including the price effect, quantity effect, and Google Play's actual and but-for market shares, with estimates based on empirical estimation or supported by empirical evidence, to calculate disgorgement and restitution. The calculations and approaches demonstrate that Mr. Solomon's disgorgement and restitution calculations are flawed. Further, as I discuss below, according to Dr. Skinner, Mr. Solomon does not properly account for Google Play's costs in his calculations. See Expert Report of Skinner ("Skinner Report").

apportioned amount.[243] Because Mr. Solomon has not performed the necessary apportionment to consumers, his disgorgement calculation is substantially overstated as a remedy for consumers.

XI.   CORRECTED CONSUMER DAMAGES, RESTITUTION, AND DISGORGEMENT CALCULATIONS

A.   Overcharge Damages Calculation

1. But-For Service Fee Rate

a.   Recent Changes in the Service Fee Rate

177.   Dr. Singer assumes, alternatively, that Google would have changed only its service fee rate in the but-for world and that it would have changed only its consumer subsidies in the but-for world. Indeed, given the platform nature of the Play Store, Google may not have chosen to adjust both the service fee and the consumer subsidies in the but-for world. In this section, I calculate consumer damages based on Google choosing only to change its service fee rate in the but-for world.

178.   Instead of making unsupported assumptions that are divorced from economic reality, as Dr. Singer and Dr. Rysman have done, a much more reasonable but-for world is one based on what happened in the recent history in the actual world. As discussed above, Google has reduced the service fee rate multiple times, with the most recent two reductions occurring on July 1, 2021 and January 1, 2022. The July 1, 2021 change reduced the Google Play service fee rate to 15% for the first $1 million of a developer's global gross earnings from paid downloads and in-app purchases

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[243] I note that Mr. Solomon's disgorgement calculation is much larger than his restitution calculation.   The most important reason for this is that the disgorgement calculation has not been apportioned to consumers, while the restitution calculation has been implicitly apportioned to consumers (because it is focused on directly measuring the harm to consumers).

(including subscriptions) in each calendar year after they complete enrollment;[244] and the January 1, 2022 change reduced the Google Play service fee rate to a flat 15% for all subscription sales through the Google Play store.[245]   As a more reasonable alternative to Dr. Singer's and Dr. Rysman's flawed approaches to determining the but-for service rate, I used Google's 2022 service fee rates as a benchmark. With Google Play serving as a benchmark for itself, economic similarity of the benchmark to the target is ensured. In 2022, as discussed above, Google has decreased its service fees in response to competitive pressure.[246]   I assume that, in the but-for world, the current rate structure as implemented in 2022 would have been adopted from an earlier point in time. That is, the service fee rate for subscriptions would have been 15% for all subscription products; the service fee rate would have been 15% for the first $1 million of each developer's annual gross revenue and 30% for the portion of their gross revenue exceeding the first $1 million. The but-for service fee rate from this earlier time point to December 2021 would be the same as the actual average service fee rate under the current rate structure, i.e., ▮▮▮▮▮▮▮ based on the period of January 2022 to May 2022.[247]

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[244] The service fee rate reverts to 30% once the $1 million annual cap (partial year cap of $500,000 for 2021) is reached. Developers must complete enrollment to receive the reduced 15% service fee rate. As noted by Google, the 15% service fee tier will go into effect on July 1, 2021 for all developers who have completed enrollment before this date; for developers who complete enrollment after July 1, 2021 the 15% will be applied starting from the date when enrollment is completed. "Changes to Google Play's service fee in 2021", Play Console Help, https://support.google.com/googleplay/android-developer/answer/10632485.

[245] "Evolving Our Business Model to Address Developer Needs," Android Developers Blog, October 21, 2021, https://android-developers.googleblog.com/2021/10/evolving-business-model.html.

[246] I note that competitive pressure may exist even if there are no actual competitors in the relevant market. See Dennis W. Carlton and Jeffrey M. Perloff, Modern Industrial Organization, 4th edition, 2005, p. 76. Note that Dr. Singer also argues that the *threat* of developer steering and multi-homing is sufficient to constraint market power and prices. Singer Class Rebuttal Report ¶ 62.

[247] Since the 15% reduced rate is applied to the first $1 million of each developer's annual global gross revenue based on their "Associated Developer Account", and that the Google Play transactions data only includes transactions associated with U.S. consumers and does not provide the "Associated Developer Account" ID, apply the average service fee rate based on the actual transactional level service fee rates in 2022 to all the

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b. China as a Comprehensive Benchmark for the But-For World

179.   Google Play is not present in China, and there are many app stores for Android devices. While there are other differences between China and the U.S., China nevertheless provides useful information regarding the but-for world in this case. Based on the evidence summarized below, circumstances in China demonstrate that the service fee rate can be even higher than 30% even if many app stores compete in the market. The costs to consumers (and developers) may be higher, as well.

180.   There are currently more than 400 Android apps stores in China, with the top 10 stores accounting for about 90% of the market.[248] The major app stores are either OEM app stores, such as Huawei AppGallery (Huawei), VIVO App Store (Vivo), and OPPO Software Store (OPPO), or third-party app stores operated by internet companies, such as Tencent My App (Tencent), 360 Mobile Assistant (Qihoo 360), and Baidu Mobile Assistant (Baidu).[249]

181.   Despite the fact that there are many app stores which compete intensely with each other, the service fee rates are relatively high, with the prevailing service fee rate for games at around 50%. Even when some of the largest app developers, such as Tencent, have managed to negotiate lower fees with some stores, the negotiated rate is still as high as 30%.[250] In addition to the service fee fees, app stores typically also charge a 2%-25% "channel fee" that is akin to a payment processing fee. For example, Huawei AppGallery charges a 2% channel fee, a 50% service fee

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transactions from the earlier time point to December 2021, rather than directly applying the first $1 million of each developer's annual gross revenue and 15% for all transactions involving subscriptions.

[248] "All You Need to Know About China's Top Android App Stores," Nativex, September 6, 2021, https://www nativex.com/en/blog/all-you-need-to-know-about-china-top-android-app-stores/.

[249] "The AppInChina App Store Index", AppInChina, May 2022, https://www.appinchina.co/market/app-stores/.

[250] "Tencent Urges App Stores to Change Revenue Sharing Model," Sohu, July 16, 2019, https://www.sohu.com/a/327058178_161105.

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rate for game in-app purchases, and a 30% for paid downloads and non-game in-app purchases.[251] The total effective service fee rate for game in-app purchases is then 2% + (1 - 2%) * 50% = 51%, and the total effective service fee rate for paid downloads and non-game in-app purchases is then 2% + (1 - 2%) * 30%=31.4%. See Exhibit 20 for the major Android app stores' service fee rates in China. The but-for service fee rate I used for my alternative damages calculations is lower than most of these rates.

182.   Developers face development and maintenance costs due to the fragmented market structure and cross-fire between OEM and third-party app stores. Different store requirements (for app listing, review timeframe, payment, and etc.) lead to a high app incompatibility rate in China ██████, nearly triple the rate in the rest of the world ██████.[252] App stores scrape each other for apps and updates without getting developer approval.[253] Developers respond by self-hosting APKs on their websites, outsourcing app publishing to third-party publishing tools and services for a fee,[254] and implementing fixes to get control over the versions on different app stores.[255]

183.   From the perspective of consumers in China, the large number of Android app stores creates challenges for app stores to screen malicious apps and leads to large variance in app stores' app review standards. As a result, consumers in China face high risk of virus, malicious ads, junk

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[251] See Exhibit 20.

[252] GOOG-APPL-00044136; "A Fragmented Market – Androids in China," Medium, April 27, 2017, https://medium.com/@david9289david/a-fragmented-market-androids-in-china-92a8c3ea71b1.

[253] GOOG-PLAY-000272539 at 578; "Why Do I Need a Security Solution for My App?," AppInChina, October 10, 2019, https://www.appinchina.co/blog/why-do-i-need-a-security-solution-for-my-app/.

[254] Third-party publishing tools and services, e.g., KuChuan, provide services to customize apps to meet different store requirements and monitoring app scraping by stores after publishing. See "KuChuan: How to Solve the Problem of Multi-Channel Publishing and Monitoring for App Developers," woshiipm, http://www.woshipm.com/it/55456.html.

[255] GOOG-APPL-00044136.

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apps, and pirated apps when downloading apps from Android mobile app stores.[256] Hence, the

existence of many app stores does not effectively expand consumers' choice sets, but rather have

resulted in a large number of low quality or malicious apps and user privacy and security issues.[257]

2. Pass-Through Rate

184.   I conservatively use the econometric estimate of the pass-through rate discussed above. As

shown in Table 8, I find that the weighted average pass-through rate (based on the upper bound of

the 95th confidence intervals) across transactions of paid downloads, IAPs, and subscriptions is

3.0%.

3. Calculation

185.   I calculate the consumer class overcharge damages as the difference between the actual

and but-for service fee rates multiplied by the pass-through rate, and then multiplied by the actual

total consumer spend. The consumer class damages from changes in the service fee rate are zero

for the period of January 2022 to May 2022, as the actual and but-for service fee rates are the same

in this period.[258] As shown in Table 11 below, the consumer class damages would be ████████

if Google's current rate structure as implemented in 2022 would have been adopted from the

beginning of the class period (August 16, 2016). I also provide consumer class damages for an

alternative period starting September 1, 2018, the date of the initial launch of the Google Play

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[256] Haoyu Wang et al., "Beyond Google Play: A Large-Scale Comparative Study of Chinese Android App
Markets," Proceedings of the Internet Measurement Conference 2018, 2018,
https://dl.acm.org/doi/abs/10.1145/3278532.3278558, at p. 9.

[257] Yi Ying Ng *et al.*, "Which Android App Store Can Be Trusted in China?," *IEEE 38th Annual Computer
Software and Applications Conference*, 2014, p. 8.

[258] The consumer class damages can be apportioned to a state-by-sate level using state-level consumer spend or
Google revenue as weights.

Points program worldwide in Japan, which amount to ███████████ . I understand that some of the allegedly anticompetitive conduct at issue, such as RSA 3.0, did not occur until 2019.

Table 11.   Consumer Class Damages

From Changes in the Service Fee Rate

	August 16, 2016 - May 31, 2022	September 1, 2018 - May 31, 2022
Consumer Damages from Overcharge	███████████	███████████

Source: See Exhibit 18.

B.   Consumer Subsidy Damages Calculation

186.   In this section, I provide an estimate of the but-for consumer subsidies that Google would have offered based on the same considerations as my estimate of the but-for service fee. This damages calculation corresponds to Dr. Singer's and Dr. Rysman's consumer subsidy-based damages calculations.

187.   Google launched the Play Points program in the U.S. in November 2019.[259] After consumers join the program with a valid payment method on Google Play, Play Points are awarded for every purchase (including paid downloads, IAPs, subscriptions, movies, and books), as well as from other actions such as program enrollment and item downloads.[260] There are four Play Points tiers offered in the U.S.: Bronze, Silver, Gold, and Platinum - the more points a consumer earns, the higher their level gets, and the more Points awards (such as weekly prizes) they will receive.[261]

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[259] "Google Play Help, Introducing Google Play Points in the U.S.," Android Developers Blog, November 4, 2019 https://android-developers.googleblog.com/2019/11/introducing-google-play-points-in-us.html.

[260] Feng Deposition, page 444: 25-445: 18, 447: 4-12, 497: 23-498: 7.

[261] "How to check your Google Play Points level & benefits", Google Play Help, https://support.google.com/googleplay/answer/9080348?hl=en&co=GENIE.CountryCode%3DUS. "Google Play Points: a rewards program for all the ways you Play", The Keyword, Nov. 4, 2019,

Specifically, consumers get one Play Point per dollar spent in the store on apps, in-app purchases, or media purchases and rentals for base tier ("Bronze"), and the reward rate increases to 1.1, 1.2, and 1.4 Points per dollar spent for "Silver", "Gold", and "Platinum" level users.[262] Google also offers special rates and promotions when consumers can get more points for every dollar spent.[263] Google funds all the Points that consumers earn and there is no cost to developers as consumers earn points.[264] Points expire one year after the last time a consumer earns or uses points.[265] During the period of November 2019 (when Points were launched in the U.S.) and May 2022 (till when the transactions data is available), assuming that 100 Points are worth $1 dollar, the dollar amount of Points subsidies offered by Google to consumers accounts for ████ % of total consumer spend.

188.   Google also offers other types of discounts to consumers, mainly through co-funding promotions with developers and directly offering promotions to consumers that reduce the net prices that consumers pay. From the beginning of the Class Period (August 16, 2016) to May 31, 2022, the non-Play Points discounts offered by Google to consumers account for ████ of total consumer spend. During the period of November 2019 and May 2022, the non-Play Points discounts offered by Google to consumers account for ████ of total consumer spend.

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https://www.blog.google/products/google-play/google-play-points-rewards-program-all-ways-you-play/. Also see "Google Launches a Rewards Program for Android Users", MUO, Nov. 5, 2019, https://www.makeuseof.com/tag/google-rewards-program-android-users/.

[262] See "What Are Google Play Points and How Can You Use Them?", MUO, Apr. 8, 2021, www.makeuseof.com/what-are-google-play-points/.

[263] "How to check your Google Play Points level & benefits", Google Play Help, https://support.google.com/googleplay/answer/9080348?hl=en&co=GENIE.CountryCode%3DUS.

[264] GOOG-PLAY-00518034. ██). See Feng Dep., page 449: 6-12, 450: 21-452: 13.

[265] "Earn and track your Google Play Points," Google Play Help, https://support.google.com/googleplay/answer/9077192?hl=en&co=GENIE.CountryCode%3DUS#:~:text=Any %20points%20you%20earn%20will,progress%20when%20you%20use%20them..

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189.   In the but-for world, I assume that the Play Points program would have begun at an earlier

point in time in the U.S. in response to greater app store competition. The but-for percentage of

the Play Points subsidies from this earlier time point to November 2019 would be the same as the

actual percentage of the Play Points subsidies when the program is actually running in the U.S.,

i.e., ███ on average based on the period of November 2019 to May 2022.

190.   Play Points do expire.[266] A Google internal document reported that ████████████

██

████████████████.[267] Consequently, I adjust the Play Points-based damages downward

by ██. Even after this adjustment, my calculation is conservative for at least two reasons. First,

some non-expired points may never get redeemed, implying that the ██ is a lower bound. Second,

some Play Points redemptions may take place well after their issuance, so the present discounted

value of a Play Point is less than its face value. Intuitively, today's value of savings resulting from,

say, 100 Play Points today is different from than if the same 100 Play Points were redeemed a year

later, due to time value of money.[268]

191.   I similarly assume that the higher non-Points discounts that Google provides to consumers

after the Play Points program was launched in the U.S. would have been applied starting at an

earlier point in time in the U.S. in response to greater app store competition. I assume that the but-

for non-Points Google discounts from this earlier time point on until November 2019 would have

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[266] Earn and track your Google Play Points, Google Play Help,
https://support.google.com/googleplay/answer/9077192?hl=en&co=GENIE.CountryCode%3DUS#:~:text=Any
%20points%20you%20earn%20will,progress%20towards%20the%20next%20level. ("Any points you earn will
expire one year after the last time you earned or used points.")

[267] GOOG-PLAY-011271382 at 401.

[268] See "Chapter 3. Time Value of Money" in Smart, Scott B., William L. Megginson, and Lawrence J. Gitman,
Corporate Finance, 2nd Edition, Thomson, 2007.

been the same as the actual percentage of non-Points Google discounts during period of November 2019 to May 2022 when the Play Points program is active in the U.S. This discount amounts to be ████ on average.

192. For the two types of consumer subsidies, I calculate the consumer class damages respectively as the difference in the actual and but-for subsidy rates multiplied by the actual total consumer spend from the time point when the but-for subsidy rate would have been applied until November 2019. The consumer class damages from either type of consumer subsidies are zero for the period of November 2019 to May 2022, as the actual and but-for subsidy rates are the same in this period.[269], [270]

Table 12.   Consumer Class Damages
From Changes in Consumer Subsidies Offered by Google

	August 16, 2016 - May 31, 2022	September 1, 2018 - May 31, 2022
Consumer Damages from Play Points	███	███
Consumer Damages from Non-Points Google Discounts	███	███
Combined	███	███

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[269] Note that my calculations do not project any future damages. I reserve the right to update the calculations for future damages when updated data becomes available.

[270] For the consumer class, I estimate aggregate damages. Empirically, less than ████ of U.S. consumers participated in the Play Points program and only up to ███ of U.S. consumers earned and redeemed Play Points. Therefore, it is highly unlikely that all or nearly all class members would have enrolled in the program in the but-for world and suffered damages as a result of the but-for Play Points. Dr. Singer has claimed otherwise, arguing that this empirical real-world observation "does not prove that a more generous program would not see more widespread redemptions. Consumers would have enhanced economic incentives to enroll and participate in a Play Points offering more valuable incentives in the but-for world, just as consumers have more incentives to participate in a more generous credit card rewards program than a less generous one." Singer Report ¶ 381. Dr. Singer then speculates that in the but-for world, "consumers could be automatically enrolled in Play Points. Discounts could be automatically redeemed at the point of purchase or even dispensed through a 'cash-back' program." Singer Report ¶ 381. However, Dr. Singer fails to provide a sound basis for his speculation, particularly for his implicit claim that all or nearly all consumers would enroll in the program, earn points, and redeem them in the but-for world.

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Source: See Exhibit 19.

C.   Variety Damages Calculation

193.   As discussed above, the variety damages calculation is entirely speculative because, for example, there is no indication as to which apps (if any) did not enter in the actual world, but would have entered in the but-for world. Without knowing which apps would have entered, the consumer loss associated with not having those apps is not ascertainable. Accordingly, variety damages, if any, cannot be reliably measured.

D.   Restitution

194.   I present the corrected restitution calculations in Tables 13 and 14. I separately calculate the restitution from changes in Google's service fee rate and consumer subsidies in the but-for world, where the percentage change in Google's per-unit revenue (i.e., the price effect) are calculated in the same way as for disgorgement. I calculate the allocated restitution amounts for each of the 39 States by using Google revenue at the state-level as weights, as shown in Exhibits 21-22.

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Table 13.   Restitution from Changes in Service Fee Rate (in Millions USD)

2016.08.16 - 2021.12.31

Description	Calculation	Profits-Based Restitution	Revenue-Based Restitution	Source
Actual Google Play Apps & Games Reve	[A]			Solomon Report, Schedule 5
Actual Service Fee Rate	*[1]*			Google Play Transactions Data
But-for Service Fee Rate	*[2]*			Estimated, See Section XI.A
Actual Play Points %	*[3]*			Google Play Transactions Data
But-for Play Points %	*[4]*			Same as Actual
Actual Google Discount %	*[5]*			Google Play Transactions Data
But-for Google Discount %	*[6]*			Same as Actual
Pass-through Rate	*[7]*			Empirical Estimate, See Exhibit 5
Percentage Reduction in Per-Unit Apps & Games Revenue	[B]			Calculated based on [1] - [7]
But-For Google Play App & Game Reve	[C] = [A]*(1-[B])			Calculated
Actual Google Play Other Revenue	[D]			Solomon Report, Schedule 5
But-For Google Play Revenue	[E] = [C]+[D]			Calculated
Actual Google Play Operating Profit Margin for App & Games	[F]			Solomon Report, Schedule 5
But-For Google Play App & Games Cost	[G] = [C]*(1-[F])			Calculated
Actual Google Play Other Costs	[H]			Solomon Report, Schedule 5
But-for Total Google Play Costs	[I] = [G]+[H]			Calculated
But-For Incremental Profits	[J] = [E]-[I]			Calculated
Actual Incremental Profits	[K]			Solomon Report, Schedule 2
Excess Profits	[L.1] = [K]-[J]			Calculated
Consumer Savings	[L.2] = [A]-[E]			Calculated
Pass-through Rate	[M]			Empirical Estimate, See Exhibit 5
Consumer Restitution (Worldwide)	[L]*[M]			**Calculated**
Geographic Area				
US	Allocated			
39 States	Allocated			

Source: Exhibit 21.

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Table 14. **Restitution from Changes in Consumer Subsidies (in Millions USD)**
2016.08.16- 2021.12.31

Description	Calculation	Profits-Based Restitution	Revenue-Based Restitution	Source
Actual Google Play Store Consumer Spen	[A]			Solomon Report, Schedule 4
Actual Service Fee Rate	[1]			Google Play Transactions Data
But-for Service Fee Rate	[2]			Same as Actual
Actual Play Points %	[3]			Google Play Transactions Data
But-for Play Points %	[4]			Estimated, See Section XI.B
Actual Google Discount %	[5]			Google Play Transactions Data
But-for Google Discount %	[6]			Estimated, See Section XI.B
Actual Developer Discount	[7]			Google Play Transactions Data
Percentage Reduction in Per-Unit Consumer Spend	[B]			Calculated based on [1] - [7]
Reduction in App & Games Revenue	[A]*[B]			Calculated
Actual Google Play Apps & Games Reve	[C]			Solomon Report, Schedule 5
Actual Google Play Other Revenue	[D]			Solomon Report, Schedule 5
But-For Google Play Revenue	[E] = [C]-[A]*[B]+[D]			Calculated
Actual Google Play Operating Profit Margin for App & Games	[F]			Solomon Report, Schedule 5
But-For Google Play App & Games Cost	[G]=([C]-[A]*[B])*(1-[F])			Calculated
Actual Google Play Other Costs	[H]			Solomon Report, Schedule 5
But-for Total Google Play Costs	[I] = [G]+[H]			Calculated
But-For Incremental Profits	[J] = [E]-[I]			Calculated
Actual Incremental Profits	[K]			Solomon Report, Schedule 2
Excess Profits	[L.1] = [K]-[J]			Calculated
Consumer Savings	[L.2] = [C]-[E]			Calculated
Pass-through Rate	[M]			
Consumer Restitution (Worldwide)	[L]*[M]			**Calculated**
Geographic Area				
US	Allocated			
39 States	Allocated			

Source: Exhibit 22.

E.   Disgorgement

195.   From an economics standpoint, a group should be entitled only to a portion of the "ill-gotten profits" that reflects the relative antitrust harm it sustained compared to other groups. Otherwise, there would necessarily be multiple recovery of the same "ill-gotten profits." The economically correct disgorgement calculation should therefore perform the necessary apportionment to consumers.

196.   Nevertheless, for the sake of completeness, under the alternative but-for service fee rates and consumer subsidies, as well as the pass-through rate empirically estimated based on app

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developers' real-world responses to service fee rate change, I present the corrected un-apportioned

disgorgement calculations in Tables 15 and 16.

197.   First, I calculate disgorgement from changes in Google's service fee rate. As shown in

Table 13, I calculate the percentage change in Google's per-unit revenue (i.e., the price effect), the

percentage change in the number of transactions in response to price change from service fee rate

reduction pass-through (i.e., the quantity effect), and Google Play's actual and but-for market

shares as follows.[271] I calculate the allocated disgorgement amounts for each of the 39 States by

using Google revenue at the state-level as weights, as shown in Exhibit 23.

- The percentage change in Google's per-unit revenue is calculated based on Google Play's actual per-unit revenue and but-for per unit revenue, where the actual per-unit revenue is obtained from Solomon Report Schedule 5, and the but-for per-unit revenue is calculated by accounting for changes in the service fee rate between the actual and but-for worlds.[272] As discussed in Section XI. A above, I assume the but-for service fee rate to be 26.0%. I use a pass-through rate of 3.0% following my empirical estimation as discussed above.

- The percentage change in the sales quantity in response to price change from service fee rate reduction pass-through is calculated as the percentage change in app price from the actual to the but-for world multiplied by the demand elasticity. The percentage change in app price is calculated to account for the pass-through of

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[271] Mr Solomon calculates disgorgement under two cost measures—(1) "adjusted costs" of Google Play, where he excludes "certain corporate-level expenses that Google has attributed to Play Store and that Google would have incurred even if the Play Store did not exist," and (2) the "fully burdened" costs of Google Play, where he "simply accepted as true Google's own representations about the fully burdened costs of Google Play." Mr. Solomon's own definition of disgorgement requires a measure of total costs "[a]ttributable [s]pecifically to and [a]ffected by Google Play's [r]evenue [g]eneration." Taking Mr. Solomon's definition of disgorgement as given, I understand from Dr. Skinner that even Mr. Solomon's "fully burdened" cost measure fails to account for all the costs attributable to and affected by the generation of Google Play revenue. Therefore, Mr. Solomon's "adjusted costs" would understate the true costs even further. Consequently, I use Mr. Solomon's fully burdened costs in my disgorgement calculations. See Solomon Report ¶¶ 10-11 and 14-15; Skinner Report.

[272] Let the pass-through rate be the change in app price divided by the change in service fee amount, i.e., $\gamma = \frac{P_2 - P_1}{t_2 P_2 - t_1 P_1}$, where t is service fee rate, P is app price, and the actual world parameters are labeled with subscript 1 and the but-for world parameters are labeled with subscript 2. The but-for to actual app price ratio can be derived as $\theta = \frac{P_2}{P_1} = \frac{1 - \gamma t_1}{1 - \gamma t_2}$. The percentage reduction in Google Play revenue from reduction in service fee is $1 - \frac{t_2 P_2 - d_1 P_2 - l_1 P_2}{t_1 P_1 - d_1 P_1 - l_1 P_1} = 1 - \theta \frac{t_2 - d_1 - l_1}{t_1 - d_1 - l_1}$, where d_1 and l_1 are Google offered non-Points discount rate and Play Points rate (same in the actual and but-for worlds).

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the service fee reduction from ██████████.[273] I conservatively use the demand elasticity that Dr. Singer uses to obtain the quantity effect, which has a magnitude of ███[274]

- As discussed in Section VI.B.2, Dr. Singer's inputs for Google Play's actual and but-for market shares are flawed and unsupported. For the purposes of my calculation, I take as given Dr. Singer's claim that "the Play Store accounted for 85.9 percent of non-Apple mobile app expenditures outside of China in 2018" and use the more appropriate expenditure share of 85.9% as Google Play's actual market share"[275] For Google Play's but-for market share, I consider two scenarios by respectively assuming that (1) the but-for market share would be 73%, which is 15% reduction from the actual share of 85.9%, based on that ONE Store gained up to 15% of the Android app store revenue share in South Korea;[276] and (2) the but-for market share is the same as the actual market share of 85.9%.[277]

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[273] As shown above, the but-for to actual app price ratio is $\theta = \frac{P_2}{P_1} = \frac{1-\gamma t_1}{1-\gamma t_2}$. Since consumer subsidy rates are the same in the actual and but-for worlds, the but-for to actual app price ratios for list price and net consumer price are the same. Hence, the percentage change in app price from the actual to the but-for world is $\theta - 1$. The increase in sales quantity is $(-1.46) \times (\theta - 1) = 1.46(1 - \theta)$.

[274] Singer Report, Table 8.

[275] Singer Report ¶ 122.

[276] "Korean app market One Store to venture into SE Asia," The Korea Economic Daily, May 10, 2022, https://www.kedglobal.com/e-commerce/newsView/ked202205100005.

[277] I reserve the right to update my calculations if more information or evidence becomes available. My calculation approach would apply to alternative assumptions regarding Google Play's but-for market share.

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Table 15.   Disgorgement from Changes in Service Fee Rate (in Millions USD)
2016.08.16 - 2021.12.31

Description	Calculation	Calculation 1 (ONE Store-Based But-for Market Share)	Calculation 2 (But-for Market Share Same as Actual)	Source
Actual Google Play Apps & Games Reven	[A]			Solomon Report, Schedule 5
Actual Service Fee Rate	[1]			Google Play Transactions Data
But-for Service Fee Rate	[2]			Estimated, See Section XI. A
Actual Play Points %	[3]			Google Play Transactions Data
But-for Play Points %	[4]			Same as Actual
Actual Google Discount %	[5]			Google Play Transactions Data
But-for Google Discount %	[6]			Same as Actual
Pass-through Rate	[7]			Empirical Estimate, See Exhibit 5
Percentage Reduction in Per-Unit Apps & Games Revenue	[B]			Calculated based on [1] - [7]
Subtotal	[C] = [A]*(1-[B])			Calculated
Demand Elasticity	[8]			Singer Merits Report, Table 8
Increase in Market Sales Quantity	[D]			Calculated based on [1] - [2], [8]
But-For Market App & Game Revenue	[E] = [C]*(1+[D])			Calculated
Actual Market Share	[F]			Singer Merits Report, ¶122
But-For Market Share	[G]			Empirical Evidence/Assumption
But-For Google Play App & Game Reven	[H] = [E]/[F]*[G]			Calculated
Actual Google Play Other Revenue	[I]			Solomon Report, Schedule 5
But-for Google Play Total Revenue	[J] = [H]+[I]			Calculated
Actual Google Play Operating Profit Margin for App & Games	[K]			Solomon Report, Schedule 5
But-For Google Play App & Games Costs	[L] = [H]*(1-[K])			Calculated
Actual Google Play Other Costs	[M]			Solomon Report, Schedule 5
But-for Total Google Play Costs	[N] = [L]+[M]			Calculated
But-For Incremental Profits	[O] = [J]-[N]			Calculated
Actual Incremental Profits	[P]			Solomon Report, Schedule 2
Disgorgement (Worldwide)	[P] - [O]			**Calculated**
Geographic Area				
US	Allocated			
39 States	Allocated			

Source: Exhibit 23.

198.   Next I calculate disgorgement from changes in Google's consumer subsidies. See Table 16. The percentage change in Google's per-unit revenue (i.e., the price effect), the percentage change in the number of transactions in response to price change from service fee rate reduction pass-through and consumer subsidy increase (i.e., the quantity effect), and Google Play's actual and but-for market shares are calculated as follows. I calculate the allocated disgorgement amounts for each of the 39 States by using Google revenue at the state-level as weights, as shown in Exhibit 24.

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- The percentage change in Google's per-unit revenue is calculated based on Google Play's actual per-unit revenue and but-for per unit revenue, where the actual per-unit revenue is obtained from Solomon Report Schedule 5, and the but-for per-unit revenue is calculated by accounting for changes in the Play Points subsidies and non-Points Google discounts between the actual and but-for worlds. [278]   As discussed in Section XI. B above, I assume the but-for Play Points subsidy rate to be █████ and the but-for non-Points discount rate to be █████.

- The percentage change in the number of transactions in response to price change from consumer subsidy increase is calculated as the percentage change in the actual and but-for app prices multiplied by the demand elasticity.   The actual app price is calculated based Solomon Report Schedule 5, and the but-for app price is calculated to account for the increase in the two types of consumer subsidies. [279]   I conservatively use the demand elasticity that Dr. Singer uses to obtain the quantity effect, which is ███.[280]

- I use the same sets of actual and but-for Google Play market shares as in Table 15.

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[278] Google Play's revenue from game and app in the actual world is $(t_1 P_1 - d_1 P_1 - l_1 P_1)$ and in the but-for world is $(t_1 P_1 - d_2 P_1 - l_2 P_1)$, where t is service fee rate (same in the actual and but-for worlds), P is app price before Google offered consumer subsidy (same in the actual and but-for worlds), d and l are Google offered non-Points discount rate and Play Points rate, and the actual world parameters are labeled with subscript 1 and the but-for world parameters are labeled with subscript 2. The reduction in Google Play revenue from increase in consumer subsidy can be derived as $(d_2 + l_2 - d_1 - l_1)P_1$.

[279] The change in consumer net app price is $\frac{(1-d_2-l_2-\alpha)P_1 - (1-d_1-l_1-\alpha)P_1}{(1-d_1-l_1-\alpha)P_1}$, where P is app price before Google offered consumer subsidy (same in the actual and but-for worlds), α is developer discount (same in the actual and but-for worlds), d and l are Google offered non-Points discount rate and Play Points rate, and the actual world parameters are labeled with subscript 1 and the but-for world parameters are labeled with subscript 2. The increase in sales quantity is $(-1.46) \times \left(\frac{(1-d_2-l_2-\alpha)}{(1-d_1-l_1-\alpha)} - 1\right) = 1.46\left(1 - \frac{(1-d_2-l_2-\alpha)}{(1-d_1-l_1-\alpha)}\right)$.

[280] Singer Report Table 8.

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Table 16.   **Disgorgement from Changes in Consumer Subsidies (in Millions USD)**
2016.08.16 - 2021.12.31

Description	Calculation	Calculation 1 (ONE Store-Based But-for Market Share)	Calculation 2 (But-for Market Share Same as Actual)	Source
Actual Google Play Store Consumer Spen	[A]			Solomon Report, Schedule 4
Actual Service Fee Rate	*[1]*			Google Play Transactions Data
But-for Service Fee Rate	*[2]*			Same as Actual
Actual Play Points %	*[3]*			Google Play Transactions Data
But-for Play Points %	*[4]*			Estimated, See Section XI. B
Actual Google Discount %	*[5]*			Google Play Transactions Data
But-for Google Discount %	*[6]*			Estimated, See Section XI. B
Actual Developer Discount	*[7]*			Google Play Transactions Data
Percentage Reduction in Per-Unit Consumer Spend	[B]			Calculated based on [3] - [7]
Reduction in App & Games Revenue	[A]*[B]			Calculated
Demand Elasticity	*[8]*			Singer Merits Report, Table 8
Increase in Market Sales Quantity	[C]			Calculated based on [3] - [8]
Actual Google Play Apps & Games Rever	[D]			Solomon Report, Schedule 5
But-For Market App & Game Revenue	[E] = ([D]-			Calculated
Actual Market Share	[F]			Singer Merits Report, ¶122
But-For Market Share	[G]			Empirical Evidence/Assumption
But-For Google Play App & Game Reven	[H] = [E]/[F]*[G]			Calculated
Actual Google Play Other Revenue	[I]			Solomon Report, Schedule 5
But-for Google Play Total Revenue	[J] = [H]+[I]			Calculated
Actual Google Play Operating Profit Margin for App & Games	[K]			Solomon Report, Schedule 5
But-For Google Play App & Games Costs	[L] = [H]*(1-[K])			Calculated
Actual Google Play Other Costs	[M]			Solomon Report, Schedule 5
But-for Total Google Play Costs	[N] = [L]+[M]			Calculated
But-For Incremental Profits	[O] = [J]-[N]			Calculated
Actual Incremental Profits	[P]			Solomon Report, Schedule 2
Disgorgement (Worldwide)	[P] - [O]			Calculated
Geographic Area				
US	Allocated			
39 States	Allocated			

Source: Exhibit 24.

XII.   MATCH PLAINTIFFS' DAMAGES

A.   Overview of Dr. Schwartz's Match Plaintiffs' Damages Calculation

199.   Match Plaintiffs' damages expert, Dr. Schwartz, "calculate[s] damages as the difference between the actual service fees Tinder and OkCupid paid for use of GPB and what those service fees would have been in the but-for world."[281]   Tinder's and OkCupid's actual service fees,

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[281] Schwartz Report, ¶ 476.

referred to by Dr. Schwartz as "GPB Service Fees," are based on the Match Plaintiffs' actual financial data that provides "reports of global revenues, service fees, and downloads by app (i.e., Match, OkCupid, OurTime, PlentyofFish, and Tinder)."[282] According to Dr. Schwartz, "in the competitive but-for world, Google would implement two distinct fees reflecting the separate services provided by [Play] and [Google Play's billing system]: a. A charge for [Play] services, *i.e.*, Discovery Value and Delivery Value. b. A charge for IAP processing services, *i.e.*, FOP Value;"[283] and, more specifically, "in the but-for world, Tinder and OkCupid would still have compensated Google for the Discovery Value and Delivery Value and would have paid a competitive rate for IAP processing services."[284] Therefore, according to Dr. Schwartz's damages model, Tinder's and OkCupid's but-for service fees, referred to by Dr. Schwartz as "But-for Service Fees," are equal to the sum of the But-for Discovery Value and But-for Delivery Value (i.e., the fees that Tinder and OkCupid would have paid for Play in Dr. Schwartz's but-for world) plus the "Competitive IAP Processing Fees" (i.e., the fees that Tinder and OkCupid would have paid for Google Play's billing system in Dr. Schwartz's but-for world).[285] Dr. Schwartz's damages are equal to Tinder's and OkCupid's "GPB Service Fees" minus their "But-for Service Fees."

200.   For the but-for value of Google Play's billing system, Dr. Schwartz "consider[s] a range of possible but-for rates for payment processing that are informed by the rates available from other providers, the rates the Match Plaintiffs' apps have historically paid to third-party processors when using their in-house systems, and Google's implied pricing for payment processing."[286] In his damages calculation Dr. Schwartz uses two sets of but-for payment processing rates: (1) ▮ and

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[282] Schwartz Report, ¶ 472. See also Schwartz Report, Attachments X-1 to X-5.
[283] Schwartz Report, ¶ 469.
[284] Schwartz Report, ¶ 476.
[285] Schwartz Report, ¶ 476.
[286] Schwartz Report, ¶ 425.

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███ for Tinder and OkCupid, respectively, which represent the effective rates over the damages period to operate their in-house payment processing systems and are used in Dr. Schwartz's Base Case damages scenario; and (2) ███, which represents the most common effective rate over the damages period using the rate structure of third-party payment processing providers and is used in Dr. Schwartz's High Rate damages scenario.[287]

201.   To quantify the but-for value of Play (i.e., Discovery Value and Delivery Value), "separate and distinct from any value provided by [Google Play's billing system],"[288] Dr. Schwarz relies on Google's ███████████████████████████████ that he claims show that █████ ██████████████████████████.[289]   According to Dr. Schwartz, ████████████ would have served as a reasonable starting point for negotiations between Match Plaintiffs and Google in the but-for world—a world in which Google was not able to tie [Play] to [Google Play's billing system]—to determine a service fee for the value provided by [Play]."[290]

202.   Ultimately, under Dr. Schwartz's Base Case and for the damages period from 7/7/2017-12/31/2021, Dr. Schwartz calculates Tinder's and OkCupid's damages of ████████ and ████████, respectively, for total damages of ████████.[291]   Using an "alternative competitive Android digital IAP processing rate" (i.e., ███) and for the damages period from 7/7/2017-12/31/2021, Dr. Schwartz calculates Tinder's and OkCupid's damages of ████████ and ████████, respectively, for total damages of ████████.[292]   Under Dr. Schwartz's Base Case and for the alternative damages period from 5/9/2018-12/31/2021, Dr. Schwartz calculates

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[287]   Schwartz Report, ¶ 425.
[288]   Schwartz Report, ¶ 456.
[289]   Schwartz Report, ¶ 456.
[290]   Schwartz Report, ¶ 456.
[291]   Schwartz Report, ¶ 480, Table 5.
[292]   Schwartz Report, ¶ 481, Table 6.

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Tinder's and OkCupid's damages of ██████████ and ██████████, respectively, for total damages of ██████████.   Using the alternative competitive IAP processing rate and for the alternative damages period from 5/9/2018-12/31/2021, Dr. Schwartz calculates Tinder's and OkCupid's damages of ██████████ and ██████████, respectively, for total damages of ██████████.[293]   I note that Dr. Schwartz also estimates damages for the period from 1/1/2022-5/20/2022.   These damages amount to ██████████ for Dr. Schwartz's Base Case and ██████████ for Dr. Schwartz's alternative scenario based on the higher IAP processing rate of ████.[294]

203.   An important implication of Dr. Schwartz's Damages Model is that in the but-for world, Dr. Schwartz assumes that the Match Plaintiffs would not have passed on any of the lower but-for service fee to consumers. This is directly inconsistent with Dr. Singer and Dr. Rysman, both of whom assume substantial pass-on would have occurred.[295] Given that consumers (including the named Plaintiffs) have Tinder, OkCupid, and other of the Match Plaintiffs' apps, awarding both Dr. Schwartz's damages and the consumer damages would amount to awarding the same damages to two different parties.

B.   Dr. Schwartz's Damages Model Suffers from Several Fundamental Flaws

204.   Dr. Schwartz's Damages Model suffers from several fundamental flaws that renders his calculation of damages inaccurate and unsupported.

205.   First, the internal Google Tinder Play Value Estimate and Play Value Model analyses on which Dr. Schwartz relies to assess the value of Play (i.e., Discovery Value and Delivery Value) to Tinder and OkCupid for his damages calculation are inappropriate to use for purposes of

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[293] Schwartz Report, ¶ 482, Table 7.
[294] Schwartz Report, ¶ 485, Table 8.
[295] In fact, Dr. Singer actually calculates a pass-through rate for Tinder of ████ to ████. See Singer Report, fn. 851.

calculating economic damages in this matter because they do not account for all sources of value that Play provides to app developers, including the Match Plaintiffs. According to Michael Marchak, Director of Play Partnerships, Strategy and Operations, Google's ███████████████ quantifies █████████████████████████████████████[296] When discussing the specific August 2019 version of Google's ██████████████ that Dr. Schwartz uses in his Damages Model, Mr. Marchak states that ██ ████████████████████████████████████[297] and that it is █████████████████████████ ███ █████████████"[298] Thus, even if one were to accept Dr. Schwartz's claim that Google's calculation of Play's value to the Match Plaintiffs would have been the starting point of negotiations over a fee for that value, Google's starting point for negotiations would have accounted for all of Play's value and not just the subset of Play value calculated in the ████████████████. Dr. Schwartz ignores this shortcoming of the ████████████, which has the effect of overstating his damages. Furthermore, although Dr. Schwartz uses Google's ████████████ and the Tinder-specific ████ ████████████ as his "starting point" for damages, it also ends up being his "end point" for damages. In doing so, Dr. Schwartz does not adjust his "starting point" to reflect any of the case-specific circumstances regarding the negotiating positions of the Match Plaintiffs and Google and, most importantly, does not adjust for the limitations in using Google's ████████████ to calculate damages, including that the model does not account for many features of Play that provide value to app developers. Furthermore, Dr. Schwartz does not account for any of the other iterations of Google's ████████████. As I demonstrate below, using other versions of

[296] Deposition of Michael Marchak, January 12, 2022, ("Marchak Dep.") at 24:4-7, 104:23-25.
[297] Marchak Dep. at 296:1-5.
[298] Marchak Dep. at 301:6-10.

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Google's ███████████ as the "starting point" for negotiations results in substantially lower (and in some cases negative) damages for the Match Plaintiffs.

206.   Second, Dr. Schwartz's damages theory is premised on the concept that each app developer at each point in time should have paid Google exactly the value Play offered it at that point in time in the but-for world. This would have had a significant impact on costs for many developers: Google would have charged some app developers a higher fee than they currently pay because the value they receive from Play, particularly the Discovery Value, is larger than the service fee that Google currently charges. For example, in Google's December 2021 version of the ███████ ████, addressed in a presentation titled, ████████████████████████ Google calculated ██████████████████████████████████

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██   In Google's August 2019 version of the ███████████, which Dr. Schwartz relies on for his Match Plaintiffs' damages calculation, Google presents ████████████████

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██████████████████████.[300] Furthermore, although Google does not charge any service fee for apps that do not have any sales, under Dr. Schwartz's damages theory all app developers would have had to pay for their Discovery Value regardless of their sales. Thus, Dr. Schwartz's logic implies that Google would have potentially charged service fees to

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[299] GOOG-PLAY-011023692 at 712.
[300] GOOG-PLAY-000337564 at 606.

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developers of free and ad-supported apps. For new apps, Play likely offers significant Discovery Value early in the lifecycle that is much larger than Google's current service fee. Again, in Dr. Schwartz's but-for world these app developers would likely have had to pay higher service fees early in their apps' lifecycles.

207.   Third, Dr. Schwartz's damages theory is also premised on the fact that Play had little value to the Match Plaintiffs, given the relatively small amounts he calculates for Play's Discovery and Delivery Value to Tinder and OkCupid, and that in the but-for world the "Match Plaintiffs would have been able to negotiate with Google prices for Android app distribution that would have been more commensurate with the value Match Plaintiffs derived from such services."[301] The value that the Match Plaintiffs derive from Play—in particular, Tinder and OkCupid—is demonstrated by their voluntary decision to provide Play as an option when they could have switched to an alternative, such as their own website, and thereby avoided the Play service fee. If Play was not particularly valuable to the Match Plaintiffs, paying the 30% fee when they could have left Play behind makes no economic sense. Sharmistha Dubey, Former CEO and current Board Member of MGI, ███

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████████████████████[302] Indeed, it is likely that the Match Plaintiffs would have lost revenues if they stopped using Google Play's billing system or removed their apps from Play altogether. According to Dr. Schwartz, who relied on a discussion with Ms. Dubey, Tinder continued to include Google Play's billing system as a payment processing option even when it

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[301] Schwartz Report ¶ 390.

[302] Deposition of Sharmistha Dubey, October 13, 2022 at 213:16-214:3.

began offering its own IAP system because ███████████████████████████

████████████████████████████████████ and ███████████████████████████

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██████████[303] Relatedly, under Dr. Singer's view of the but-for world, Play would retain an

approximate 60% share even when competing with other payment processing systems.[304] Thus, if

the Match Plaintiffs had removed their apps from Play, their revenues associated with the

consumers who stayed on Play would have been at risk. Moreover, the Match Plaintiffs may have

feared that if they changed their billing and distribution systems, a significant share of their

subscribers may have been prompted to cancel their subscriptions.[305] Finally, the Match Plaintiffs

update their apps frequently in order to drive user engagement and these updates are distributed

through Play.[306] The Match Plaintiffs would have risked disruption in their business strategies if

they had moved their apps out of Play. A plausible explanation for the Match Plaintiffs' decision

to stay in Play is that the store delivered value that exceeded the Google Play service fee.

208.   Fourth, Dr. Schwartz's Damages Model does not account for any of the Discovery Value

or Delivery Value that Play provided to Tinder or OkCupid prior to the damages period when

Google distributed these apps for free through Play. As noted above, an app may have much higher

Discovery Value or Delivery Value early in its lifecycle than later, but higher sales late in its

lifecycle than earlier. Google has chosen to implement a pricing system for Play that effectively

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[303] Schwartz Report ¶ 371. Dr. Schwartz also claims that Tinder was concerned that Google would retaliate if it did not offer GPB as a payment processing option, but offers no evidence to support such a claim.

[304] Singer Report, fn. 686.

[305] Deposition of Adrian Ong, October 14, 2022, Exhibit 928 (MATCHGOOGLE00087739).

[306] Declaration of Peter Foster In Support of Plaintiffs' Motion for Temporary Restraining Order, May 10, 2022, ¶ 54 ██

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holds off on charging an app until later in the lifecycle when it is generating greater sales. Dr. Schwartz's approach to damages would allow the Match Plaintiffs to exploit this fundamental nature of Google's pricing system to free-ride on the Discovery Value and Delivery Value that Play provided to the Match Plaintiffs prior to the damages period. Eliminating the free-ride would substantially reduce or eliminate Match Plaintiffs' claimed damages.

209.   Fifth, although Dr. Schwartz's characterization of the but-for world is predicated on the assumption that Google would have charged app developers two separate fees—one fee for Google Play's billing system and another fee for Play[307]—Dr. Schwartz fails to account for the Discovery Value and Delivery Value received by the Match Plaintiffs' other apps (such as Match, PlentyofFish, and OurTime) in the but-for world from Play. According to Dr. Schwartz's characterization of the but-for world, Google would still need to be compensated for the Discovery Value and Delivery Value provided by Play (separate from the value provided by Google Play's billing system), and there is no reason why Dr. Schwartz's Damages Model should ignore the Discovery Value and Delivery Value received by all of the Match Plaintiffs' apps. However, Dr. Schwartz's Damages Model does not account for the Match Plaintiffs' other apps' but-for Discovery Value and Delivery Value for revenues they realized as a result of Play and, therefore, his damages are overstated and unreliable.

210.   Finally, Dr. Schwartz's Damages Model fails to account for the increased costs that Match Plaintiffs (and other developers) would have incurred in the but-for world. For example, to distribute apps through a larger set of app stores that might have existed in the but-for world, Match

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[307] Schwartz Report, ¶ 476 ("in the but-for world, Tinder and OkCupid would still have compensated Google for the Discovery Value and Delivery Value and would have paid a competitive rate for IAP processing services").

Plaintiffs would have had to incur the transaction costs associated with negotiating with each store and meeting the store's compliance requirements. Dr. Schwartz's Damages Model does not incorporate any such costs. Additionally, Google could have chosen to charge service fees to free and ad-supported apps in the but-for world. This would have adversely affected Match Plaintiffs. Again, Dr. Schwartz does not address any of these potential costs to the Match Plaintiffs.

C. Dr. Schwartz's Damages Model Understates the Discovery Value and Delivery Value That the Match Plaintiffs Receive from Play

1. The Purpose of the ██████████████ Relied on by Dr. Schwartz Is Not To Produce a Specific or Exact Valuation of Play

211.   As previously discussed, Dr. Schwartz's Damages Model relies on ██████████ ██████████,[308] ████████████████, and ███████████████,[309] ██, to quantify the Discovery Value and Delivery Value that Tinder and OkCupid would have received from Play in the but-for world. However, Dr. Schwartz's use of these internal Google analyses in his Damages Model results in an unreliable calculation of damages.

212.   First and foremost, Dr. Schwartz claims to use the results of Google's ██████████ applied to Tinder as a "starting point" for negotiations between Google and the Match Plaintiffs. In other words, Dr. Schwartz proposes a bargaining model where Google would have used the results of its ██████████ to begin the process of determining the appropriate service fee for the value provided by Play to the Match Plaintiffs. However, it makes no sense that Google would have ultimately concluded its negotiations with the Match Plaintiffs by settling at the exact lowest possible value of Play that it believes is provided to the Match Plaintiffs, as Dr. Schwartz claims.

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[308] GOOG-PLAY-011274244.

[309] GOOG-PLAY-000337564.

Rather, the actual end point of the bargaining between Google and the Match Plaintiffs would likely have been at a much higher value for Play as demonstrated by the numerous other iterations of the ███████████ that Dr. Schwartz conveniently chose to ignore without explanation. A higher value for Play is also supported by the fact that Google's ███████████ understates the value of Play because it does not account for all of the features that Play provides to Tinder, OkCupid, and the other Match Plaintiffs' apps.

213.   Second, according to Mr. Marchak, a member of the team that has worked on Google's ███████████ since its beginning, the initial motivation of the project was ███████████ ██"[310] Mr. Marchak expands on the main reasons why Google pursued the ███████████: ████████████████████ ██ ██ ████████████████████████████████████"[311] Furthermore, the results of the ███████████ were used for ██ ███████████"[312] Based on a conversation with Google personnel familiar with the ███████████ ███████, its initial purpose was to ████████████████████████████████████ ██ ██ ██ ██

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[310] Marchak Dep. at 35:11-13.
[311] Marchak Dep. at 36:17-37: 2.
[312] Marchak Dep. at 38:5-6.

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███████████████████████.[313]

214.   Third, the underlying data and calculations supporting Google's ████████████ also provide an indication of how the model is intended to be used: ████████████████

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████████████████████"[314] Additionally, what I understand to be the most recent iteration of ██████████████████, which is discussed in ████████████ presentation titled, ████ ██████████████████████████ also ████████████████████████████████

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215.   Fourth, I understand that Google's ██████████████████████████ of ████████████ that was specifically used by Dr. Schwartz in his Damages Model was based on the application of just one version of the ██████████████. I further understand that around this time Google was consistently modifying and refining the ██████████████ by incorporating and testing different

[313] Discussion with Krishna Shrinivas, Head of Research and Insights, Android and Play Strategy, November 14, 2022.

[314] GOOG-PLAY-004625919.

[315] GOOG-PLAY-011023692 at 692.

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assumptions about the drivers of Play value, which resulted in a wide range of results produced by the model.[316] For example, in the same June 2019 ███████████████, Google calculated a ██████████████ of ████████████████████████████.[317] Just two months later, in August 2019, Google calculated ██████████████████ of ████████ ████████.[318] Furthermore, Sarah Karam, the Global Head of Apps and Partnerships of Google Play in June 2019 ██ ████████████, confirms that Google was ████████████████████████████████ ██[319] Additionally, ████████ ████████████████████████ but ████████████████████████████ ████████████████████"[320] Thus, simply relying on just one iteration of the ████████████ ██████, particularly at a time when the Google ████████████ was in its initial stages, constantly changing, and only quantified a portion of the total value that Play offered to app developers, is inappropriate for purposes of a damages calculation and, therefore, generates unreliable results.

216.   Therefore, given the purpose of the ████████████ in general, and the versions of this model that address the purported value of Play ████████████████████████████████████ ████████████████████████, it is inappropriate for Dr. Schwartz to rely on the results of just one of these models, and not to perform any of the necessary adjustments, to quantify the Match

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[316] Discussion with Krishna Shrinivas, Head of Research and Insights, Android and Play Strategy, November 14, 2022.

[317] GOOG-PLAY-011274244 at 250.

[318] GOOG-PLAY-000337564 at 580; GOOG-PLAY-004625919, "data" tab.

[319] Deposition of Sarah Karam, September 28, 2022, ("Karam Dep.") at 121:20-122:5.

[320] Karam Dep. at 122:12-21.

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Plaintiffs' damages in this matter. This is a particularly critical flaw in Dr. Schwartz's Damages Model because, as I discuss in the next section, the ███████████ significantly understates the value of Play to app developers because it does not account for all of the services provided by Play.

> **2. The ████████████ Relied on by Dr. Schwartz Understate the Value That the Match Plaintiffs Receive from Play Because They Do Not Quantify the Value of All Play Services**

217.   Google's ██████████████ and ██████████ are also unreliable for calculating damages in this matter because both internal Google analyses make it clear that they do not quantify the value of all services provided through Play. As a result, by not accounting for the value of all Play services, Dr. Schwartz's Damages Model understates the but-for Discovery Value and Delivery Value that Tinder and OkCupid receive from Play and, therefore, overstates the Match Plaintiffs' alleged damages.

218.   For example, according to Google's ████████████████ :

███[21]

Additionally, according to the slide titled, ████████████████████ in Google's ██ ████████, ███████████████████████████████████ ██████ █ ████████

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[321] GOOG-PLAY-011274244 at 244.

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219.   The underlying data and calculations supporting Google's ████████████ also indicate

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██

████████████████████████████ „324

220.   Finally, Google's most recent iteration of its ████████████████████████████

██

██

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[322] GOOG-PLAY-000337564 at 572. See also the slide titled, ████████████████████████████
████████████████████ GOOG-PLAY-000337564 at 590.

[323] GOOG-PLAY-000337564 at 573, 591.

[324] GOOG-PLAY-004625919.

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███ [325] Proposed next steps for

the evolution of the Play Value Model include ████████████████████████████ [326]

More specifically, in this latest version of the Play Value Model, Google ███████████

██

██

███████████████████████████ [327] According to Google: ████████████████

██

██

███████████████████████████████████ " [328] Google then states

that ████████████████████████████████ █ ████████████████████████

██

██████████████████████████████ [330]

221.   In summary, Google's Play Value Model, Tinder Play Value Estimate, and supporting

materials make it clear that not all Play services are accounted for in the analyses. Therefore, the

results of these models understate the value of Play, particularly the Discovery Value, to app

developers such as Tinder and OkCupid. This results in an understatement of Dr. Schwartz's

calculation of Tinder's and OkCupid's but-for Discovery Value and Delivery Value and a

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[325] GOOG-PLAY-011023692 at 692. Throughout the presentation, including on the Executive Summary slide, there
   is a caveat that states: ██ GOOG-PLAY-011023692 at
   705.

[326] GOOG-PLAY-011023692 at 695.

[327] GOOG-PLAY-011023692 at 706.

[328] GOOG-PLAY-011023692 at 706.

[329] GOOG-PLAY-011023692 at 707.

[330] GOOG-PLAY-011023692 at 708.

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corresponding overstatement of Match Plaintiffs' damages. This is a fundamental flaw in Dr. Schwartz's Damages Model.

3. Dr. Schwartz Ignores Other Versions of the ████████████ That If Used In His Damages Model Would Reduce the Match Plaintiffs' Damages

222. Dr. Schwartz relies on ████████████████████████████ ████████████ to calculate the Match Plaintiffs' damages and does not explain why he chose to use this version over ████████████████████████████████. █ ████████████████████████████████ used by Dr. Schwartz in his Damages Model has the ████████████████████████████████████ and results in the highest damages for the Match Plaintiffs. As I illustrate below, using ████████████████ ████████████████████████████ in Dr. Schwartz's Damages Model would significantly lower the Match Plaintiffs' damages. ████████████████ ████████████ which Dr. Schwartz chose to ignore without any explanation, include the following:

- ████████████████
  - o Dr. Schwartz relies on the ████████ in this model that generates a Tinder Play Value of ████████, ████████ of ████████, T████████ of ████, ████████, and ████████ of ████████.[331]
  - o **Alternative ██ Valuation #1**: This model also provides an alternative ██ valuation that generates a Tinder Play Value of ████████, ████████████ of ████, ████████, ████████ of ████, and ████████ of ████.[332]
- ████████████████

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[331] GOOG-PLAY-011274244 at 246. This version of the model also generates a ████████ OkCupid Play Value of ████████, ████████████████ of ████████, and ████████████ of ████████. GOOG-PLAY-011274244 at 247. I note that without explanation Dr. Schwartz ignores the OkCupid valuation in his Damages Model and instead relies on the Tinder valuations to estimate similar values for OkCupid.

[332] GOOG-PLAY-011274244 at 250.

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o **Alternative CPI Valuation #2**: This model provides another CPI valuation that generates a Tinder Play Value of ████████, Tinder Discovery Value of ████████, Tinder ███ Value of ████████, and Tinder ███ Value of ████████.[333]

o **Alternative LTV Valuation #1**: This model provides an ███ valuation that generates a Tinder Play Value of ████████, Tinder ███ Value of ████████, Tinder ███ Value of ████████, and Tinder ███ Value of ████████.[334]

223. Dr. Schwartz uses the initial ███ valuation in the ████████████ and adjusts the ████████ of ████████ to an ███ valuation because he claims that Google asserted ██████████████████████████████████████ ██[335] ███ ███ ████████████████████.[336] Furthermore, according to Google, ██████████ ███ ████████████████████████.[337] In contrast, the initial ███ valuation in the ████████████ that Dr. Schwartz uses in his Damages Model, identified as a ████ ████ model, has Pros including ████████████████████████

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[333] GOOG-PLAY-000337564 at 580; GOOG-PLAY-004625919.

[334] GOOG-PLAY-000337564 at 580; GOOG-PLAY-004625919.

[335] Schwartz Report, ¶ 459. ██████████████████████████████ ███ ████████████████████ GOOG-PLAY-004625919; GOOG-PLAY-000337564 at 578.

[336] Discussion with Krishna Shrinivas, Head of Research and Insights, Android and Play Strategy, November 14, 2022.

[337] GOOG-PLAY-000337564 at 578.

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including ███

███████████████████████[338]

224.   Therefore, Dr. Schwartz's decision to rely on only one version (and the most aggressive version in terms of damages) of ███████████████████████, to adjust this version of the model from ██████ to ███████, and to ignore other █████████████ versions of Tinder's Play Value Model is unsupported. As I discuss below, I have implemented all available versions of ███████████████████████ in to Dr. Schwartz's Damages Model to demonstrate the effect that these alternative models have on his calculation of Tinder's and OkCupid's ███████████████ and, ultimately, damages.

D.   Dr. Schwartz's Damages Model Suffers from Several Errors Related to His Treatment of the Google Transaction Data

225.   Dr. Schwartz committed several errors in his processing of Google's transaction data, which I have outlined below:

- Inclusion of Canceled Transactions

  o ██
     ██
     ██
     ████████████████████████████████ As these transactions are not considered completed transactions, Dr. Schwartz's inclusion of them in his analysis is inappropriate.[339]

- Inclusion of Test Transactions

  o ██
     ████████████████████████████ Dr. Schwartz includes in his analysis transactions that

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[338] GOOG-PLAY-000337564 at 578.

[339] See B. Rocca Letter to Plaintiffs re Transactional Data, August 23, 2022.

meet these criteria. As these test transactions are not considered completed transactions, Dr. Schwartz's inclusion of them in his analysis is inappropriate.[340]

- **Failure to Convert Non-US Currencies to US Dollars**

  o ███
    ███████████████████████████ Dr. Schwartz includes transactions with over 40 different currencies and erroneously does not convert them into U.S. dollars for his analysis.[341]

- **Inclusion of Transactions with Zero Unit Price**

  o I understand that transactions with a unit price of zero do not incur transaction fees. Dr. Schwartz erroneously includes in his analysis these zero-price transactions and assigns them transaction fees.[342]

- **Exclusion of Certain Transactions**

  o There are a number of transactions missing from Dr. Schwartz's analysis that are present in the underlying Google transaction data. I have investigated and am unaware of any reason these transactions should have been excluded from Dr. Schwartz's analysis.

In total, Dr. Schwartz's errors in his treatment of the Google transaction data account for ███

████ in revenue and ████████ transactions in Attachment X-6 of his report. I note that for

the sensitivities discussed in the following section I use an updated version of Attachment X-6

that corrects for the errors enumerated above.

E.   Sensitivity Analysis of Dr. Schwartz's Damages Model

1.   **Correcting Dr. Schwartz's** ████████ **Adjustment**

226.   Dr. Schwartz's damages analysis for Tinder begins with the ████████ Tinder ██ Play

Value presented in the ████████████████████. Dr. Schwartz then applies an adjustment of

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[340] See B. Rocca Letter to Plaintiffs re Transactional Data, January 14, 2022.

[341] See backup materials to this report.

[342] See backup materials to this report. While Google does not charge service fees for orders with zero unit price, it is unclear whether third-party payment processing providers would charge a transaction fee for such transactions. Thus, to be conservative, I assume that these transactions would not be subject to any service fees and do not include them in my analysis.

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███ to this figure based on the Tinder ███ Play Value of ███████ and Tinder ███ Play Value of ███████ presented in the Play Value Model (█████████████████████). Specifically, he applies the ████ adjustment to the ████████ Tinder ███ Play Value to estimate a Tinder ███ Play Value of ████████ Then he subtracts from this figure the ████████ Tinder ███ Value and █████████ Tinder Delivery Value resulting in an estimated Tinder ███ Discovery Value of ████████ for the period from Q1 2018 through Q1 2019. Dividing ███ ██████ by █████████ Google Play Tinder Installs during the same period results in a Baseline Tinder ████████ Value per Install of ████████ This figure is a critical input for Dr. Schwartz's calculation of Tinder's ███████ Value in the but-for world and for Dr. Schwartz's calculation of OkCupid's ███████ Value in the but-for world, which starts with the Tinder ████████ figure and then performs some further adjustments to transform it into an OkCupid figure.[343]

227.   However, Dr. Schwartz could have performed his adjustment with the more detailed information presented in the Excel spreadsheet that provides the underlying data and calculations supporting the figures presented in the ██████████[344] Specifically, the underlying data and calculations provide the Tinder ███████ Values corresponding to the Tinder ███ Play Value of ████████ and Tinder ███ Play Value of ████████ presented in the ████████ and which are used by Dr. Schwartz to calculate his ███ ████████ adjustment.[345] Rather than using the ████ ████████ adjustment based on data at the Play Value level, Dr. Schwartz should have calculated a more accurate ████████ adjustment at the ███████ Value level using

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[343] Schwartz Report, ¶¶ 458-459. See also Schwartz Report, Attachment D-3.

[344] GOOG-PLAY-004625919.

[345] GOOG-PLAY-004625919, "data" tab.

the Discovery Value figures in the underlying data and calculations of the Play Value Model. I note that Dr. Schwartz does not explain why he chose to ignore this more relevant data.

228.   Using the underlying data and calculations of the Play Value Model, I have calculated a more accurate ███████ adjustment as follows:

- Tinder ███████ Value = ███████
- Tinder ███████ Value = ███████.
- ███████████ Value Adjustment = ███████████████████.

Applying the more accurate ███████████ Value adjustment of ████ to the Tinder ██ ███████ Value of ███████ from the ███████████████ generates an estimated Tinder ███████ Value of ███████ (versus ███████ based on Dr. Schwartz's calculation). Dividing ███████ by ███████ Google Play Tinder Installs during the Q1 2018 to Q1 2019 period results in a Baseline Tinder ███████ Value per Install of ███████ (versus ███████ based on Dr. Schwartz's calculation).

229.   The first sensitivity analysis of Dr. Schwartz's damages that I perform involves replacing Dr. Schwartz's Baseline Tinder ███████ Value per Install of ███████ with the ███████ calculated above. Doing so results in the Match Plaintiffs' damages figures presented in Table 17 (Dr. Schwartz's original Match Plaintiffs' damages figures are presented in italics).

Table 17. **Sensitivity Analysis #1: Summary of Match Plaintiffs' Damages Correcting Dr. Schwartz's CPI-to-LTV Adjustment**

Application	7/7/2017 — 12/31/2021		5/9/2018 — 12/31/2021		1/1/2022 — 5/20/2022	
	Historic Own IAP System Rate (Base Case)	High Rate	Historic Own IAP System Rate (Base Case)	High Rate	Historic Own IAP System Rate (Base Case)	High Rate
Tinder	███					
OkCupid						
Total Damages						

Source: See Exhibit 25.

2.   Removing Dr. Schwartz's ███████ Adjustment

230.   As discussed above, ██

██

████████████████████████████████████ [346]   Therefore, there is no reasonable justification for Dr. Schwartz adjusting the ██████ valuation in the ███████████████ to an ██████████

231.   I have removed Dr. Schwartz's ███████ adjustment and, alternatively, have used the Tinder ██████ Value of ███████ presented in the █████████████ (versus Dr. Schwartz's adjusted ███████ figure). Dividing ███████ by ███████ Google Play Tinder Installs during the Q1 2018 to Q1 2019 period results in a Baseline Tinder ██████ Value per Install of ███████ (versus ███████ based on Dr. Schwartz's calculation).

232.   The second sensitivity analysis of Dr. Schwartz's damages that I perform involves replacing Dr. Schwartz's Baseline Tinder ███████ Value per Install of ███████ with

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[346] GOOG-PLAY-000337564 at 578.

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the ███████ calculated above. Additionally, I replaced Dr. Schwartz's Baseline OkCupid

███████ Value per Install of ███████, which he calculates based on the Baseline Tinder

███████ Value per Install of ███████ with a more accurate and direct calculation of

this figure. Specifically, I use the ███████ OkCupid ███████ Value presented in the

Tinder Play Value Estimate and divide this figure by ███████ Google Play OkCupid Installs

during the Q1 2018 to Q1 2019 period to calculate a Baseline OkCupid ███████ Value per

Install of ███████ (versus ███████ based on Dr. Schwartz's calculation). Doing so results

in the Match Plaintiffs' damages figures presented in Table 18 (Dr. Schwartz's original Match

Plaintiffs' damages figures are presented in italics).

Table 18.   Sensitivity Analysis #2: Summary of Match Plaintiffs' Damages Removing Dr. Schwartz's ███████ Adjustment

| Application | 7/7/2017 — 12/31/2021 | | 5/9/2018 — 12/31/2021 | | 1/1/2022 — 5/20/2022 | |
	Historic Own IAP System Rate (Base Case)	High Rate	Historic Own IAP System Rate (Base Case)	High Rate	Historic Own IAP System Rate (Base Case)	High Rate
Tinder						
OkCupid						
Total Damages						

Source: See Exhibit 25.

3.   Dr. Schwartz Ignores Other ███████

     a.   ███████

233.   In the ███████ relied on by Dr. Schwartz there is ███████

███████[347] This ███████ provides a Tinder ███████

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[347] GOOG-PLAY-011274244 at 249-252.

Value of ███████ and an estimated OkCupid ████████ Value of ████████.[348] I refer to this valuation as the Alternative ██ Valuation #1.

234.   Applying the more accurate ████████████ Value adjustment of ███ to the ████████████ Value of ████████ generates an estimated ████████████ Value of ████████ (versus ████████ based on Dr. Schwartz's calculation). Dividing ████ ████ by ████████ Google Play Tinder Installs during the Q1 2018 to Q1 2019 period results in a Baseline Tinder ████████ Value per Install of ████████ (versus ████████ based on Dr. Schwartz's calculation).

235.   The third sensitivity analysis of Dr. Schwartz's damages that I perform involves replacing Dr. Schwartz's Baseline Tinder ████████ Value per Install of ████████ with the ████████ calculated above. Doing so results in the Match Plaintiffs' damages figures presented in Table 19 (Dr. Schwartz's original Match Plaintiffs' damages figures are presented in italics). Given that the total damages figures are negative, under this scenario the Match Plaintiffs suffered no damages and, in fact, received more value from Play in the but-for world than the actual service fees paid.

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[348] GOOG-PLAY-011274244 at 250.

Table 19. **Sensitivity Analysis #3: Summary of Match Plaintiffs' Damages** ▮▮▮▮▮▮▮ **Valuation #1 and Correcting Dr. Schwartz's** ▮▮▮▮▮ **Adjustment**

Application	7/7/2017 — 12/31/2021		5/9/2018 — 12/31/2021		1/1/2022 — 5/20/2022	
	Historic Own IAP System Rate (Base Case)	High Rate	Historic Own IAP System Rate (Base Case)	High Rate	Historic Own IAP System Rate (Base Case)	High Rate
Tinder	███████					
OkCupid	███████					
Total Damages	███████					

Source: See Exhibit 25.

236.   I have also performed a sensitivity analysis where I use the Tinder ▮▮▮▮▮▮ Value of ▮▮▮▮▮ and OkCupid ▮▮▮▮▮ Value of ▮▮▮▮▮ but do not apply Dr. Schwartz's ▮▮▮▮ adjustment. Dividing ▮▮▮▮▮ by ▮▮▮▮ Google Play Tinder Installs during the Q1 2018 to Q1 2019 period results in a Baseline Tinder ▮▮▮▮▮ Value per Install of ▮▮▮▮ (versus ▮▮▮▮▮ based on Dr. Schwartz's calculation). Dividing ▮▮▮▮▮ by ▮▮▮ Google Play OkCupid Installs during the Q1 2018 to Q1 2019 period results in a Baseline OkCupid ▮▮▮▮▮▮ per Install of ▮▮▮▮ (versus ▮▮▮▮▮ based on Dr. Schwartz's calculation).

237.   The fourth sensitivity analysis of Dr. Schwartz's damages that I perform involves replacing Dr. Schwartz's Baseline Tinder ▮▮▮▮▮ Value per Install of ▮▮▮▮ with the ▮▮▮▮ calculated above, and replacing Dr. Schwartz's Baseline OkCupid ▮▮▮▮▮ Value per Install of ▮▮▮▮ with the ▮▮▮▮ calculated above. Doing so results in the Match Plaintiffs' damages figures presented in Table 20 (Dr. Schwartz's original Match Plaintiffs' damages figures are presented in italics). Given that the total damages figures are negative, under

this scenario the Match Plaintiffs suffered no damages and, in fact, received more value from Play in the but-for world than the actual service fees paid.

Table 20.   **Sensitivity Analysis #4: Summary of Match Plaintiffs' Damages** ███████ **Valuation #1 and Removing Dr. Schwartz's** ███████ **Adjustment**

Application	7/7/2017 — 12/31/2021		5/9/2018 — 12/31/2021		1/1/2022 — 5/20/2022	
	Historic Own IAP System Rate (Base Case)	High Rate	Historic Own IAP System Rate (Base Case)	High Rate	Historic Own IAP System Rate (Base Case)	High Rate
Tinder	██████	██████	██████	██████	██████	██████
OkCupid	██████	██████	██████	██████	██████	██████
Total Damages	██████	██████	██████	██████	██████	██████

Source: See Exhibit 25.

b.   ███████   **and Underlying Data and Calculations**

238.   In ███████ relied on by Dr. Schwartz to perform his ███████ adjustment there is an alternative ███████ for Tinder.[349] In the underlying data and calculations for this version of the model, the ███████ provides a Tinder ██ ███ Value of ███████.[350] I refer to this valuation as the ███████ Valuation #2. Despite having access to ███████ for Tinder, and the underlying data and calculations that provide the ███████ ███████ Dr. Schwartz does not rely on this ███████ nor does he explain why he chose to ignore it.

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[349] GOOG-PLAY-000337564 at 580; GOOG-PLAY-004625919, "data" tab.

[350] GOOG-PLAY-004625919, "data" tab. I note that there is no corresponding OkCupid ███████ Value provided ███████

239.   I have performed a sensitivity analysis where I use the Tinder ████████ Value of ████████ and do not apply Dr. Schwartz's ████████ adjustment. Dividing ████████ by ████████ Google Play Tinder Installs during the Q1 2018 to Q1 2019 period results in a Baseline Tinder ████████ Value per Install of ████████ (versus ████████ based on Dr. Schwartz's calculation). I note that the Tinder ████████ in the ████████ Valuation #2 is ████████, which is different from the ████████ used in Dr. Schwartz's Damages Model of ████████. Therefore, in this scenario I have also updated the calculation of the Baseline Tinder ████████ per Install by dividing ████████ by ████████ Google Play Tinder Installs during the Q1 2018 to Q1 2019 period resulting in a per-install figure of ████████ (versus ████████ based on Dr. Schwartz's calculation).

240.   The fifth sensitivity analysis of Dr. Schwartz's damages that I perform involves replacing Dr. Schwartz's Baseline Tinder ████████ Value per Install of ████████ with the ████████ calculated above, and replacing Dr. Schwartz's Baseline Tinder ████████ per Install of ████████ with the ████████ calculated above. Doing so results in the Match Plaintiffs' damages figures presented in Table 21 (Dr. Schwartz's original Match Plaintiffs' damages figures are presented in italics). Given that the total damages figures are negative, under this scenario the Match Plaintiffs suffered no damages and, in fact, received more value from Play in the but-for world than the actual service fees paid.

Table 21. **Sensitivity Analysis #5: Summary of Match Plaintiffs' Damages** ▮▮▮▮▮▮ **Valuation #2 and Removing Dr. Schwartz's** ▮▮▮▮▮ **Adjustment**

Application	7/7/2017 — 12/31/2021 Historic Own IAP System Rate (Base Case)	High Rate	5/9/2018 — 12/31/2021 Historic Own IAP System Rate (Base Case)	High Rate	1/1/2022 — 5/20/2022 Historic Own IAP System Rate (Base Case)	High Rate
Tinder	▮	▮	▮	▮	▮	▮
OkCupid	▮	▮	▮	▮	▮	▮
Total Damages	▮	▮	▮	▮	▮	▮

Source: See Exhibit 25.

4. Dr. Schwartz Ignores Other LTV-Based Play Value Models

241. In the Play Value Model relied on by Dr. Schwartz to perform his ▮▮▮▮▮ adjustment there is also an alternative ▮▮▮▮▮ Model for Tinder.[351] In the underlying data and calculations for this version of the model, the alternative ▮▮▮▮▮ provides a Tinder ▮▮▮▮▮ of ▮▮▮▮▮.[352] I refer to this valuation as the ▮▮▮▮▮ Valuation #1. As discussed above, despite having access to ▮▮▮▮▮ for Tinder, and the underlying data and calculations that provide the ▮▮▮▮▮ ▮▮▮▮▮, Dr. Schwartz does not rely on this ▮▮▮▮▮ nor does he explain why he chose to ignore it.

242. I have performed a sensitivity analysis where I use the Tinder ▮▮▮▮▮ Value of ▮▮▮▮▮ and given that this analysis already begins with an ▮▮▮▮▮ Value there is no need to apply any ▮▮▮▮▮ Dividing ▮▮▮▮▮ by ▮▮▮▮▮ Google

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[351] GOOG-PLAY-000337564 at 580; GOOG-PLAY-004625919, "data" tab.

[352] GOOG-PLAY-004625919, "data" tab. ▮▮▮▮▮
▮▮▮▮▮

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Play Tinder Installs during the Q1 2018 to Q1 2019 period results in a Baseline ████ ████ Value per Install of ████████ (versus ████████ based on Dr. Schwartz's calculation).   I note that the ████████████████ in the ████████████ Valuation #1 is ████████ which is different from the ████████████ used in Dr. Schwartz's Damages Model of ████████ Therefore, in this scenario I have also updated the calculation of the Baseline Tinder ████████████████████ by dividing ████████ by ████████ Google Play Tinder Installs during the Q1 2018 to Q1 2019 period resulting in a per-install figure of ████████████ (versus ████████████ based on Dr. Schwartz's calculation).

243.   The sixth, and final, sensitivity analysis of Dr. Schwartz's damages that I perform involves replacing Dr. Schwartz's Baseline Tinder ████████████ Value per Install of ████████████ with the ████████████ calculated above, and replacing Dr. Schwartz's Baseline Tinder Delivery Value per Install of ████████████ with the ████████████ calculated above. Doing so results in the Match Plaintiffs' damages figures presented in Table 22 (Dr. Schwartz's original Match Plaintiffs' damages figures are presented in italics).

Table 22.   Summary of Match Plaintiffs' Damages
████████████ Valuation #1 and Removing Dr. Schwartz's ████████ Adjustment

Application	7/7/2017 — 12/31/2021		5/9/2018 — 12/31/2021		1/1/2022 — 5/20/2022	
	Historic Own IAP System Rate (Base Case)	High Rate	Historic Own IAP System Rate (Base Case)	High Rate	Historic Own IAP System Rate (Base Case)	High Rate
Tinder						
OkCupid						
Total Damages						

Source: See Exhibit 25.

F.   Alternative Match Plaintiffs' Damages

244.   I have performed an alternative calculation of the Match Plaintiffs' damages that incorporates but-for service fees consistent with those discussed earlier in this report (i.e., I assume that the current service fee rate structure would have been adopted at or before the start of the damages period). Therefore, for my alternative damages calculation the but-for service fee rate for the Match Plaintiffs' subscription revenues processed through Google Play's billing system is 15% for the entire damages period.[353] The but-for service fee rate for the Match Plaintiffs' IAP revenues processed through Google Play's billing system is 15% for the first $1 million of annual sales and 30% for the remaining sales in each year for the entire damages period. Applying these but-for service fee rates to the Match Plaintiffs' subscription and IAP revenues processed through Google Play's billing system[354] and subtracting them from the service fees the Match Plaintiffs actually paid results in the alternative Match Plaintiffs' damages figures presented in Table 23 (Dr. Schwartz's original Match Plaintiffs' damages figures are presented in italics).

245.   Given that I assume the current service fee rate structure would have been adopted at or before the start of the damages period, in the but-for world the Match Plaintiffs would not only pay service fees for its subscription and IAP revenues processed through Google Play's billing system but also for its subscription and IAP revenues processed through third-party payment processing systems for apps purchased in Play, namely when the Match Plaintiffs utilize their own respective payment processors on Android. I understand that in South Korea and the European Economic Area ("EEA"), Google currently offers a 3-4 percentage points discount on service fees

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[353] I adopt Dr. Schwartz's damages periods for this calculation.

[354] OkCupid, Plenty of Fish (also "POF"), and Tinder are the only Match Plaintiffs' apps to have processed revenues through Google Play's billing system.

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for revenues processed through third-party payment processing systems,[355] and I have assumed

that Google would have offered a 4 percentage points discount in the but-for world, starting at the

beginning of the damages periods. Thus, any damages calculated based on an overcharge of Match

Plaintiffs' revenues processed through Google Play's billing system should be offset by the

additional fees Match Plaintiffs would owe Google associated with revenues processed through

third-party payment processing systems. For subscription revenues processed through third-party

payment processing systems, the but-for service fee rate for the Match Plaintiffs' subscription

revenues is ███████████████ for the entire damages period.[356] The but-for service fee rate for

the Match Plaintiffs' IAP revenues processed through third-party payment processing systems is

████████████████ for the first $1 million of annual sales and ██████████████ for the

remaining sales in each year for the entire damages period. Applying these but-for service fee

rates to the Match Plaintiffs' subscription and IAP revenues processed through third-party billing

systems[357] and subtracting the resulting figures from the damages calculated associated with

revenues processed through Google Play's billing system results in the alternative Match

Plaintiffs' damages figures presented in Table 23 (Dr. Schwartz's original Match Plaintiffs'

damages figures are presented in italics).

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[355] "Changes to Google Play's Billing Requirements for Developers Serving Users in South Korea," Google, https://support.google.com/googleplay/android-developer/answer/11222040; "An Update on Google Play Billing in the EEA," Google, July 19, 2022, https://blog.google/around-the-globe/google-europe/an-update-on-google-play-billing-in-the-eea/.

[356] I adopt Dr. Schwartz's damages periods for this calculation.

[357] Data availability permitting, I include all of the Match Plaintiffs' apps that used third-party payment processors over the course of the damages period in my calculations.

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Table 23.   Alternative Match Plaintiffs' Damages

	7/7/2017 — 12/31/2021	5/9/2018 — 12/31/2021	1/1/2022 — 5/20/2022
Damages for Revenue Processed Using Google Play's Billing Service			
Fees Owed to Google for Match Plaintiffs' Revenue Processed Using Third-Party Billing Services			
Total Damages			

Source: See Exhibits 25, 33a-33d.

246.   The negative total damages figures in Table 23 above indicate that, in this construction of the but-for world, the Match Plaintiffs would owe more as service fees on Android revenue that was processed through third-party payment processors than what the Match Plaintiffs were overcharged on revenue processed through Google Play's billing system. Since I applied the current rate structure for the entire damages period, this analysis again demonstrates that the Match Plaintiffs' actual fees paid to Google likely understate the amount of value they actually received from Play during the damages period.

G.   Dr. Schwartz Makes Unsupported Claims In An Attempt to Support His Damages Model

1.   Dr. Schwartz Makes Inaccurate Claims Regarding Google's Acknowledgement That Its 30% Fee Is Supracompetitive

247.   Dr. Schwartz states that "Google knew it was charging Match Plaintiffs a supracompetitive price,"[358] and "[t]he best evidence that the 30% rate is supracompetitive comes from Google itself."[359] However, the evidence that Dr. Schwartz cites does not support these claims. For example, Dr. Schwartz cites to ███████████████████████████████

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[358] Schwartz Report, ¶ 370.

[359] Schwartz Report, ¶ 375.

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██

██[360] But Dr. Schwartz

conveniently ignores ███

████████████████████████████████[361]   Therefore, Dr. Schwartz's supposed evidence is

misleading because ███

████████████████████████████████████

248.   As another example, Dr. Schwartz cites a slide titled, ███████████████

██████████ from a September 2020 Google presentation, and only addresses ███████

███████████████████████████[362] The initial issue listed on the slide is ███████

███████████[363]   This reflects ████████████████████ and is not an acknowledgement

by Google that it charges a supracompetitive price or believes that the value provided by Play to

the Match Plaintiffs is not consistent with the fees paid to Google, as Dr. Schwartz claims.

Furthermore, Dr. Schwartz conveniently ignores the ████████████████████████

██

██

██

██████████████████[364]   Thus, Dr. Schwartz has presented an incomplete picture of the message

that this slide is attempting to present.

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[360] Schwartz Report, ¶ 375; GOOG-PLAY-007328838 at 850.

[361] GOOG-PLAY-007328838 at 850.

[362] Schwartz Report, ¶ 375; GOOG-PLAY-007346079 at 109.

[363] GOOG-PLAY-007346079 at 109.

[364] Schwartz Report, ¶ 375; GOOG-PLAY-007346079 at 109.

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249.   Dr. Schwartz also cites to a 2019 email from a Google employee that indicates ███████

███████████████████████████████████ [365]   Dr. Schwartz does

not cite to or address the statement that follows: ████████████████████████

███████████████████████████████████

███████████████████████████████████

███████████████████████████████████ [366]

Again, Dr. Schwartz is presenting an incomplete picture of what this slide is attempting to present.

Furthermore, given that the Play Value Model for Tinder referred to in this email is incomplete

and does not capture the value of several items that Tinder values, it is inappropriate to use this as

evidence to support his claim that Google acknowledges that its 30% fee is supracompetitive.

2.   Dr. Schwartz Makes Inaccurate Claims About Play's Value to the Match Plaintiffs and How It Is Less Than the Value Enjoyed by the Vast Majority of App Developers

250.   Dr. Schwartz makes several claims about Play's value to Match, including as compared to

other app developers, and purports to supply evidence from the record that support his claims. In

one instance, he states that ████████████████████████████████████

███████████████████████████████████ [367]

However, as discussed at length above, this is not an accurate representation of the facts.

According to Michael Marchak, Director of Play Partnerships Strategy and Operations, ███████

███████████████████████████████████ [368]

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[365] Schwartz Report, ¶ 375; GOOG-PLAY-007355763 at 763.

[366] GOOG-PLAY-007355763 at 763.

[367] Schwartz Report, ¶ 446.

[368] Marchak Dep. at 24: 4-7, 104: 23-25.

When discussing the specific August 2019 version of Google's Play Value Model that Dr. Schwartz references to support the above claim, Mr. Marchak states that ███████████ ██[369] and that it is ██ █████████████████████████████████[370] Dr. Schwartz also states that Google ███ ████████████████████████ However, the source he uses to support this claim merely states that ██ ██████████████████████[371] not that this is something Google as a company accepts to be true. Google has repeatedly indicated, through testimony in this matter and in the source documents themselves, that ██ ███ ███████

251.   Dr. Schwartz also states that when the evidence is "[t]aken as a whole, in the case of the Match Plaintiffs, GPS primarily serves as a tool from which users can download the desired Match Plaintiffs' app to their smartphone."[372] He goes on to claim that "[i]t is the app itself which keeps users engaged and is responsible for delivering content and an experience that users are willing to pay for, and none of that is attributable to Google or GPS."[373] However, Dr. Schwartz fails to consider any evidence relating to the ██████████████████████████ (among other types of

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[369] Marchak Dep. at 296: 1-5.

[370] Marchak Dep. at 301: 6-10.

[371] GOOG-PLAY-007346079 at 109.

[372] Schwartz Report, ¶ 453.

[373] Schwartz Report, ¶ 453.

value) that Play provided to Tinder and OkCupid prior to the damages period when Google distributed these apps for free through Play. While Tinder and other Match Plaintiffs' apps may currently have some brand recognition and view Play primarily as a "tool from which users can download" their apps, this was not always necessarily the case, especially during the beginning stages of the app's lifecycle. As noted above, ███████████████████████████████

███

███

██   By ignoring evidence from early in the Match Plaintiffs' apps' lifecycles, Dr. Schwartz understates the value of Play and renders his claims about its value to Match unreliable. Furthermore, Dr. Schwartz's analysis regarding the share of app acquisitions from categorical searches is unsound. He relies on this analysis as evidence that many of the Match Plaintiffs' users do not discover the apps through categorical searches but search for them specifically in the Play Store, implying ████████████████ However, Dr. Schwartz's classification of whether or not specific search terms are considered "categorical" appears to be arbitrary. For example, he classifies the search term "chat app" as categorical but not the search term "chit chat app." He also classifies the search term "cougars dating app" as categorical but not the search term "cougar dating app free." Classifying some terms as categorical while ignoring other nearly identical terms underestimates the implied value of Play to the Match Plaintiffs.

Finally, Dr. Schwartz claims that the evidence demonstrates that "[Google Play store's] value to Match Plaintiffs is less than the value enjoyed by the vast majority of other app developers."[374]

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[374] Schwartz Report, ¶ 445.

However, he provides almost no evidence that discusses the Match Plaintiffs in the context of other app developers. In the case of the few examples of evidence that do mention other app developers, Dr. Schwartz provides no explanation as to how these pieces of evidence imply the Match Plaintiffs are distinct from the "vast majority" of app developers as to the value they receive from Play.

XIII. CONCLUSIONS

252.   Plaintiffs' experts have failed to describe the but-for world with clarity, which means that their damages calculations—which necessarily rest on predictions of but-for world outcomes—are unsupported. For example, Dr. Rysman's damage calculation rests on the prediction that there would be a large number of additional apps in the but-for world, but he fails to explain where these apps would have come from. Dr. Singer assumes the Google Play store would have had a lower share in the but-for world, but fails to identify which competing stores would have gained share in the but-for world and explain how they would have accomplished those share gains.

253.   In addition, Plaintiffs' experts make a number of unsupported and flawed assumptions about other critical inputs to their calculations. For example, Dr. Singer and Dr. Rysman both assume that the service fee pass-through rate is high (91.1% and 100%, respectively). However, empirical analysis of actual market data demonstrates that the service fee pass-through rate is only at most 3% in the aggregate, much lower than they have assumed. Dr. Singer makes an unsupported assumption about Google Play's but-for share, relying on a supposed benchmark that has little in common economically with mobile app stores. Dr. Rysman makes the unsupported assumption that apps are symmetric (i.e., the same) in terms of their quality, demand, costs, and price. His calculation would be substantially different if he accounted for the asymmetries among apps that are present in the real world.

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254.   Mr. Solomon's disgorgement and restitution calculations rely on inputs sourced from Dr. Singer's and Dr. Rysman's. Because the latter calculations are flawed, so are the former. In addition, from an economics point of view, a disgorgement calculation should apportion the claimed "ill-gotten gains" to the particular plaintiff in question. Mr. Solomon did not perform any apportionment to the Plaintiffs.

255.   Dr. Schwartz's calculations of the Match Plaintiffs' damages are flawed because he makes unsupported assumptions about Google's fee structure in the but-for world. He leaves unexplained how this claimed but-for fee structure would work for other app developers and whether it would be Google's optimal choice of fee structure. In addition, Dr. Schwartz bases his estimate of Match's but-for payments on an internal Google analysis of the potential value of those services, but fails to account for the fact that the analysis did not fully value all aspects of Play and went through a number of iterations over time. Indeed, Dr. Schwartz based his calculations on only one of the iterations—the one that yielded the lowest value of Play to the Match Plaintiffs. Had Dr. Schwartz used any of the other iterations, his calculated damages would have been much lower than he estimated, or even negative. Finally, Dr. Schwartz ignores that Match would have still owed fees for app discovery and delivery for Match apps that did not use Google Play's billing system. Accounting for the fees on these transactions would result in a substantial offset to Dr. Schwartz's calculated damages.

256.   I performed two alternative consumer damages calculations. In the first calculation , I use Google's current (2022) service fee structure as an estimate of its but-for world service fee structure. Under this approach, I calculate consumer damages for the period from August 16, 2016 to May 31, 2022 to be up to ▮▮▮▮▮▮. In the second calculation, I use Google's level of consumer subsidies after the Play Points program was introduced in the U.S. as an estimate of its

but-for world consumer subsidies. Under this approach, I calculate consumer damages for the period from August 16, 2016 to May 31, 2022 to be up to ███████ related to Play Points and up to ███████ based on other types of consumer discounts.

257.   From an economics point of view, "restitution" should be the same as consumer damages.

258.   Finally, I have calculated Match Plaintiffs' damages under the assumption that the 2022 Google Play service fees would have been in effect from the beginning of the Match Plaintiffs' damages period. Using this approach, the Match Plaintiffs are calculated to have paid ███████ more in service fees for the period from 7/7/2017 – 12/31/2021 and ███████ for the period from 5/9/2018 – 12/31/2021 than they would have paid in the but-for world. However, I also find that Google would have charged a service fee for Match Plaintiffs' transactions that were not processed through Google Play's billing system and Match would have to pay these service fees to Google in the but-for world. After accounting for this offset, damages for both periods are negative (i.e., Match Plaintiffs' would owe more to Google than the alleged excess services fees it paid to Google). Thus, Match Plaintiffs are not entitled to any damages.

Gregory K. Leonard

Gregory K. Leonard

Dated: November 18, 2022

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CRA Charles River Associates

Appendix A. Resume

Gregory K. Leonard
Vice President

PhD, Economics
Massachusetts Institute of Technology

ScB, Applied Mathematics-Economics
Brown University

Dr. Gregory K. Leonard is a vice president in the Antitrust & Competition Economics Practice of CRA. He specializes in applied microeconomics and econometrics. He has provided testimony before US federal and state courts, government agencies, and arbitration panels on issues involving antitrust, damages estimation, statistics and econometrics, surveys, valuation, and labor market discrimination.

Dr. Leonard has written extensively in the areas of antitrust, industrial organization, econometrics, intellectual property, class certification, and labor economics. His publications have appeared in journals such as the *RAND Journal of Economics*, the *Journal of Industrial Economics*, the *Journal of Econometrics*, the *International Journal of Industrial Organization*, and the *Antitrust Law Journal*, among others. Dr. Leonard's writings were cited by the Court of Appeals for the Federal Circuit in its *Uniloc* decision. He is the Editorial Board Vice Chair for Economics of the *Antitrust Law Journal* and has served as a referee for numerous economic journals.

Dr. Leonard has given invited presentations on antitrust and intellectual property issues at the (US) Federal Trade Commission, the US Department of Justice, the former Anti-Monopoly Bureau of China's Ministry of Commerce, the Supreme People's Court of China, and Japan's Fair Trade Commission. He served as a consultant on the issue of immunities and exemptions to the (US) Antitrust Modernization Commission.

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"Comparison of the Almost Ideal Demand System and Random Coefficient Models for Use With Retail Scanner Data," Pacific Rim Conference, Western Economic Association, Beijing, People's Republic of China, January 12, 2007 (with F. Deng).

Discussant, "Applied Economics" Session, Pacific Rim Conference, Western Economic Association, Beijing, People's Republic of China, January 12, 2007.

"Balancing IPR Protection and Economic Growth in China," International Conference on Globalization and the Protection of Intellectual Property Rights, Chinese University of Political Science and Law, Beijing, People's Republic of China, January 20, 2007.

"The Use and Abuse of Daubert Motions on Damages Experts: Lessons from Recent Cases," LSI Workshop on Calculating & Proving Patent Damages, February 27, 2007.

"Will Your Licenses Ever be the Same? Biotechnology IP Strategies," BayBio 2007 Conference, April 26, 2007.

"Tension Between Antitrust Law and IP Rights," Seminar on WTO Rules and China's Antimonopoly Legislation, Beijing, People's Republic of China, September 1, 2007.

"Issues to Consider in a Lost Profits Damages Analysis," Patent Litigation 2007, Practicing Law Institute, September 25, 2007.

Discussant, "Dominance and Abuse of Monopoly Power" Session, China's Competition Policy and Anti-Monopoly Law, J. Mirrlees Institute of Economic Policy Research, Beijing University, and the Research Center for Regulation and Competition, Chinese Academy of Social Sciences, Beijing, People's Republic of China, October 14, 2007.

"Opening Remarks," Seminar on China's Anti-monopoly Law and Regulation on Abuse of Intellectual Property Rights, Beijing, People's Republic of China, April 26, 2008.

"Issues to Consider in a Reasonable Royalty Damages Analysis," Patent Litigation 2008, Practicing Law Institute, October 7, 2008.

"Econometric Evaluation of Competition in Local Retail Markets," Federal Trade Commission and National Association of Attorneys General Retail Mergers Workshop, December 2, 2008,

"Merger Review Best Practices: Competitive Effects Analysis," International Seminar on Anti-Monopoly Law: Procedure and Substantive Assessment in Merger Control, Beijing, People's Republic of China, December 15-17, 2008.

"The Use of Natural Experiments in Antitrust," Renmin University, Beijing, People's Republic of China, December 18, 2008.

"China's Antimonopoly Law: An Economist's Perspective," Bloomberg Anti-Monopoly Law of China Seminar, January 29, 2009.

Panelist, "Standards for Assessing Patent Damages and Their Implementation by Courts," FTC Hearings on the Evolving IP Marketplace, February 11, 2009.

"Economic Analysis of Agreements Between Competitors" and "Case Study: FTC Investigates Staples' Proposed Acquisition of Office Depot," Presentation to Delegation of Antitrust Officials from the People's Republic of China, Washington, DC, March 23, 2009.

"Reasonable Royalties in the Presence of Standards and Patent Pools," LSI Workshop, April 20, 2009.

Presentations on Unilateral Effects, Buyer Power, and the Intellectual Property-Antitrust Interface to Delegation from the Anti-Monopoly Bureau of MOFCOM of the People's Republic of China, Washington, DC, May 10-11, 2009.

Panelist, "The Use of Economic and Statistical Models in Civil and Criminal Litigation," Federal Bar Association, San Francisco, May 13, 2009.

"Trends in IP Rights Litigation and Economic Damages in China," Pursuing IP in the Pacific Rim, May 14, 2009.

Presentation on the Economics of Antitrust, National Judicial College of the People's Republic of China, Xi'an, People's Republic of China, May 25-26, 2009.

"Case Study: The Use of Economic Analysis in Merger Review," Presentation to the Anti-Monopoly Bureau of MOFCOM, Beijing, People's Republic of China, May 27, 2009.

"Economics and Antitrust Law," China University of Political Science and Law, Beijing, People's Republic of China, September 21, 2009.

"Case Study: Economic Analysis of Coordinated Interaction," Presentation to the Anti-Monopoly Bureau of MOFCOM, Beijing, People's Republic of China, September 22, 2009.

"Relevant Market Definition," 4th Duxes Antitrust Law Seminar, Beijing, People's Republic of China, September 26, 2009.

"Expert Economic Testimony in Antitrust Litigation," Supreme People's Court, Beijing, People's Republic of China, February 2, 2010.

"New Case Law for Patent Damages," Law Seminars International Telebriefing, April 28, 2010.

"China/India: Sailing in Unchartered Waters: Regulating Competition in the Emerging Economies – New Laws, New Enforcement Regimes and No Precedents," The Chicago Forum on International Antitrust Issues, Northwestern University School of Law Searle Center, May 20, 2010.

"Antitrust and Intellectual Property," Supreme People's Court, Beijing, People's Republic of China, May 26, 2010.

"Cartel Enforcement Trends in the United States," 2nd Ethical Beacon Anti-Monopoly Summit, Beijing, People's Republic of China, May 27, 2010.

Panelist, "The Future of Books and Digital Publishing: the Google Book Settlement and Beyond," 2010 American Bar Association Annual Meeting, August 7, 2010.

"Coordinated Effects" and "Non-Horizontal Mergers," Presentations to Delegation from India Competition Commission, US Chamber of Commerce, Washington, DC, October 26, 2010.

"UPP and Merger Simulation," Annual Conference of the Association of Competition Economics, Norwich, UK, November 11, 2010.

"Uniloc v. Microsoft: A Key Ruling For Patent Damages," Law Seminars International Telebriefing, January 21, 2011.

"Correlation, Regression, and Common Proof of Impact," New York City Bar Association, January 19, 2011.

"Private Litigation Under China's New Antimonopoly Law," Bar Association of San Francisco, February 17, 2011.

"Competition Law and State Regulation: Setting the Stage and Focus on State-Owned Enterprises," Competition Law and the State: International and Comparative Perspectives, Hong Kong, People's Republic of China, March 18, 2011.

Panelist, "Booking it in Cyberspace: The Google Book Settlement and the Aftermath," American Intellectual Property Law Association, San Francisco, May 13, 2011.

"Econometric Estimation of Cartel Overcharges," ZEW Conference on Economic Methods and Tools in Competition Law Enforcement, Mannheim, Germany, June 25, 2011.

Panelist, "Antitrust and IP in China," Antitrust and IP in Silicon Valley and Beyond, American Bar Association and Stanford University, Palo Alto, October 6, 2011.

Panelist, University of San Diego School of Law Patent Law Conference: The Future of Patent Law Remedies, January 18, 2013.

"Economics Framework," US-China Workshop on Competition Law and Policy for Internet Activities, China's State Administration for Industry and Commerce (SAIC) and the U.S. Trade and Development Agency (USTDA), Shenzhen, People's Republic of China, June 4-5, 2013.

Panelist, "China Inside and Out," American Bar Association, Beijing, People's Republic of China, September 16-17, 2013.

Panelist, "Remedies in Patent Cases," Fifth Annual Conference on The Role of the Courts in Patent Law & Policy, Berkeley and Georgetown Law Schools, November 1, 2013.

"Royalty Base," LeadershIP Conference, Qualcomm Incorporated, March 21, 2014.

"Reflections on Natural Experiments," DG Comp, April 8, 2014.

Panelist, "Antitrust in Asia: China," American Bar Association Section of Antitrust Law, Beijing, People's Republic of China, May 21-23, 2014.

Panelist, "Patent Damages Roundtable," 2015 Intellectual Property Institute, University of Southern California Gould School of Law, Los Angeles, March 23, 2015.

Panelist, "IP and Antitrust – The Current State of Economic Analysis," Global Competition Review Live 2nd Annual IP & Antitrust USA, Washington, DC, April 14, 2015.

Panelist, "FRAND Royalty Rates After Ericsson v. D-Link," American Bar Association, May 15, 2015.

Participant, Patent Damages Workshop, University of California-Berkeley, March 3, 2016.

Panelist, "FRANDtopia – In a Perfect World," LAIPLA Spring Conference, May 5, 2018.

Panelist, "Chicago Forum on International Antitrust Issues," Northwestern Pritzker School of Law, June 15, 2018.

Panelist, "Competition in Digital Advertising: Is There Online and Offline Convergence?," Challenges to Antitrust in a Changing Economy, Harvard Law School, November 8, 2019.

Testimonies given in the last four years

Boston Scientific Corporation and Boston Scientific Scimed, Inc. v. Edwards Lifesciences Corporation; *Edwards Lifesciences Corporation, Edwards Lifesciences PVT, Inc. and Edwards Lifesciences LLC v. Boston Scientific Corporation, Boston Scientific Scimed, Inc., and Sadra Medical, Inc.*, United States District Court for the District of Delaware, Case No. 16-CV-275 (SLR), 2017 (Deposition), 2018 (Trial Testimony).

Depomed, Inc. v. Purdue Pharma L.P., The P.F. Laboratories, Inc., and Purdue Pharmaceuticals L.P., United States District Court for the District of New Jersey, Civil Action No. 3:13-00571 (BRM/TJB), 2018 (Deposition).

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Janssen Biotech, Inc. v. Celltrion Healthcare Co., Ltd., Celltrion, Inc., and Hospira, Inc., United States District Court for the District of Massachusetts, Civil Action No. 1:17-CV-11008, 2018 (Deposition).

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Asustek Computer Incorporated, et al. v. InterDigital, Inc., et al., United States District Court for the Northern District of California, San Jose Division, Case No. 15-CV-1716 BLF, 2018 (Deposition).

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In the Matter of: Determination of Rates and Terms for Digital Performance of Sound Recordings and Making of Ephemeral Copies to Facilitate those Performances (Web V), before the United States Copyright Royalty Board Library of Congress, Docket No. 19-CRB-0005-WR (2021-2025), 2020 (Deposition, Trial Testimony).

Expert Report of Dr. Gregory K. Leonard

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Professional activities

Member, American Economic Association

Member, Econometric Society

Member, American Bar Association

Contributor, www.antitrust.org

Contributor, ABA Section of Antitrust Law, *Econometrics*, 2005

Associate Editor, *Antitrust*, 2007-2010

Senior Editor, *Antitrust Law Journal*, 2012-; Associate Editor, 2010-2012

Co-Editor, ABA Section of Antitrust Law Economics Committee Newsletter, 2009-2012

Member, Economics Task Force, ABA Section of Antitrust Law, 2011-2012

Member, ABA Delegation to International Seminar on Anti-Monopoly Law: Procedure and Substantive Assessment in Merger Control, Beijing, People's Republic of China, December 15-17, 2008.

Member, Working Group for drafting the "Joint Comments of the American Bar Association Section of Antitrust Law and Section of International Law on the MOFCOM Draft Guidelines for Definition of Relevant Markets," 2009.

Member, Working Group for drafting the "Joint Comments of the American Bar Association Section of Antitrust Law and Section of International Law on the SAIC Draft Regulations on the Prohibition of Acts of Monopoly Agreements and of Abuse of Dominant Market Position," 2009.

Member, Working Group for drafting the "Joint Comments of the American Bar Association Section of Antitrust Law and Section of International Law on the SAIC Draft Regulations on the Prohibition of Acts of Monopoly Agreements and of Abuse of Dominant Market Position," 2010.

Referee: *Econometrica*, *Review of Economics and Statistics*, *International Journal of Industrial Organization*, *Review of Industrial Organization, Journal of Sports Economics*, *Journal of Environmental Economics and Management*, *Research in Law and Economics*, *Labour Economics*, *Eastern Economic Journal*, *Journal of Forensic Economics, Antitrust, Antitrust Law Journal, Journal of Competition Law and Economics, Advances in Econometrics.*

Professional history

12/2019–Present	*Vice President*, Charles River Associates
2012–2019	*Partner*, Edgeworth Economics
2008–2012	*Senior Vice President*, NERA Economic Consulting
2004–2008	*Vice President*, NERA Economic Consulting
2000–2004	*Senior Vice President*, Lexecon, Inc.
1991–2000	*Director*, Cambridge Economics, Inc.
1990–1991	*Senior Analyst*, NERA Economic Consulting
1989–1990	*Assistant Professor*, Columbia University

- Econometrics

- Statistics

- Labor Economics

Appendix B
Documents Relied Upon

Report and Exhibits

Bates Documents

AMZ-GP_00001629	EPIC_GOOGLE_03979041	GOOG-APPL-00044136	GOOG-PLAY-000272539
GOOG-PLAY-000337564	GOOG-PLAY-000542516	GOOG-PLAY-000542516.R	GOOG-PLAY-000565541
GOOG-PLAY-000565541.R	GOOG-PLAY-000604733	GOOG-PLAY-001291192	GOOG-PLAY-001507601
GOOG-PLAY-003331764	GOOG-PLAY-003335786.R	GOOG-PLAY-004625919	GOOG-PLAY-00518034
GOOG-PLAY-005535886	GOOG-PLAY-007203251	GOOG-PLAY-007328838	GOOG-PLAY-007346079
GOOG-PLAY-007346097	GOOG-PLAY-007355763	GOOG-PLAY-011023692	GOOG-PLAY-011271382
GOOG-PLAY-01127244	GOOG-PLAY-011274244	GOOG-PLAY3-000018260	MATCHGOOGLE00105742
MATCHGOOGLE00105770	MATCHGOOGLE00105797	MATCHGOOGLE00105815	MATCHGOOGLE00106377
MATCHGOOGLE00106378	MATCHGOOGLE00106379	MATCHGOOGLE00106380	MATCHGOOGLE00115561
MATCHGOOGLE00115566	MATCHGOOGLE00119761	SEA_GOOGLE_00000720	

Depositions

Deposition and Exhibits of Adrian Ong, October 14, 2022.

Deposition and Exhibits of Daniel Scalise, March 11, 2022.

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Deposition and Exhibits of Michael Marchak, January 12-13, 2022.

Deposition and Exhibits of Paul Feng, January 14 and 18, 2022.

Deposition and Exhibits of Richard Czeslawski, June 17, 2021.

Deposition and Exhibits of Sarah Karam, September 28, 2022.

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Expert Reports

Class Certification Reply Report of Dr. Hal J. Singer, April 15, 2022.

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Expert Report of Dr. Michelle Burtis, March 31, 2022.

Expert Report of Dr. Steven Schwartz, October 3, 2022.

Expert Report of Saul Solomon, October 3, 2022.

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Email from B. Rocca (Morgan Lewis), "B. Rocca Letter to G. Arenson re Transactional Data," October 11, 2021.

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Screenshots of Tinder Mobile App Downloaded from Google Play as of November 16, 2022.

APPENDIX C

PASS-THROUGH ESTIMATION

A.   Estimation Approach

a.   Paid Downloads and IAPs

1.   Starting from July 1, 2021, Google lowered the service fee rate for a developer's first $1 million annual global revenue from 30% to 15%, provided that the developer enrolls in the program. This change reduced the service fee rate for IAPs and paid downloads by a uniform 15 percentage points for the group of developers who enroll in the program and have annual revenue below the $1 million cap. A second group of developers who do not enroll in the program or have annual revenue that far exceeds the $1 million cap continue to pay a 30% or close to 30% service fee on their paid downloads and IAPs.[1] As discussed in the report, I use the former group as the "treated" group and the latter as the "control" group. I quantify the extent of pass-through by comparing the price changes *before and after* Google's service fee rate change *between* these two groups of developers.

2.   The control group serves as a benchmark for the treated group. Because the control group contains a number of different control units which may be of varying usefulness as controls for the treated units, I use the Synthetic Control Method (SCM, hereafter). This method involves constructing a "synthetic" control by taking a convex combination of the control units so as to maximize the similarity of the synthetic control to the (average) treated unit in the period

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[1] On July 1, 2021, Google reduced the service fee rate from 30% to 15% to each developer's first $1 million consumer spend made in each calendar year (with the partial year cap of $0.5 million for 2021). The service fee rate will return to 30% once the $1 million annual cap is reached. Developers need to complete enrollment to receive the service fee rate reduction. See "Changes to Google Play's service fee in 2021," Play Console Help, https://support.google.com/googleplay/android-developer/answer/10632485. For developers whose annual revenue far exceeds $1 million, the monthly average service fee rate stay close to 30% even if they enroll.

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prior to the service fee rate change.[2] SCM has become widely used in empirical economics research and is described by the 2022 Nobel Laureate in Economics Guido Imbens as "arguably the most important innovation in the policy evaluation literature in the last 15 years."[3]

3.   I use an extension of the original SCM approach designed for situations with a large number of treated and control units as is the case here.[4] The method gives an estimate of the percentage difference between the prices before and after the service rate change for the "treated" group that is caused by the service rate change. I then convert this estimate into the pass-through rate. Specifically, let α denote the difference in the logarithm of the actual price of the treatment group (p_o) and the counterfactual price of the treatment group (p_c), i.e., $\alpha = \log\left(\frac{p_o}{p_c}\right)$, and let r_c and r_o be the Google's service fee on the treated units before and after the intervention. Let $\hat{\alpha}$ be an estimate of α using SCM and let $\hat{\sigma}$ be the standard error in the estimation. Then a commonly used estimate for the relative price change $(p_o/p_c - 1)$ is $\hat{\beta} = e^{\hat{\alpha} - \frac{\hat{\sigma}^2}{2}} - 1$. Consequently, I estimate the pass-through rate as

$$\widehat{PT} = \frac{p_o - p_c}{r_o p_o - r_c p_c} = -\frac{p_o/p_c - 1}{(r_c - r_o) - r_o(p_o/p_c - 1)} = -\frac{\hat{\beta}}{r_c - r_o - r_o \hat{\beta}}$$

   b. Subscriptions

[2]   Abadie, Alberto, and Javier Gardeazabal, "The Economic Costs of Conflict: A Case Study of the Basque Country," American Economic Review (2003) 93 (1): 113–32; Abadie, Alberto, Alexis Diamond, and Jens Hainmueller, "Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program," Journal of the American Statistical Association (2010) 105 (490): 493–505.
[3]   Athey, Susan, and Guido W. Imbens. 2017. "The State of Applied Econometrics: Causality and Policy Evaluation." Journal of Economic Perspectives 31 (2): 3–32.
[4]   Michael W. Robbins, Jessica Saunders & Beau Kilmer, "A Framework for Synthetic Control Methods With High-Dimensional, Micro-Level Data: Evaluating a Neighborhood-Specific Crime Intervention," Journal of the American Statistical Association (2017) 112 (517): 109-126.

4.   The July 1, 2021 service fee reduction also applies to a developer's first $1 million annual global revenue from subscriptions, provided that the developer enrolls in the program. This change reduces the service fee rate of subscriptions by up to 15 percentage points for the group of developers who enroll in the program and have gross annual revenue below the $1 million cap.[5] Another service fee rate reduction for subscriptions began on January 1, 2022 and reduces the service fee rate for all subscription products to a flat 15%.[6] This group of subscription products, i.e., those that paid more than 15% before July 1, 2021 and started paying a lower rate of 15% after July 1, 2021 provided that their developers enrolled in the program, are used as the treatment units. Since the January 1, 2022 rate reduction applies to all subscription products, I use the subscription products that have been subject to a 15% service fee rate throughout the study periods as the control group. These subscription products were subject to a 15% service fee rate during the pre-period because they were either in a developer deal program (e.g., ▮▮▮▮▮▮▮▮▮▮) or their sales during the pre-period mostly (or entirely) consist of sales to users who have been subscribers longer than 12 months (and therefore were subject to 15% since the January 1, 2018 subscription rate change).[7] I quantify the extent of pass-through for subscriptions by comparing the price changes *before and after* Google's service fee rate change *between* the subscription products of

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[5] Subscriptions may be subject to a blended rate of 15% and 30% before July 1, 2021, as the January 1, 2018 service fee rate change reduced the service fee rate for subscription sales from subscribers lasting more than 12 months. "Google Play Lowers App Subscription Fee to 15 Percent, Matches Apple's Offering," Gadgets 360, October 20, 2017, https://gadgets.ndtv.com/apps/news/google-play-app-subscription-fee-30-percent-to-15-1764923.

[6] "Evolving Our Business Model to Address Developer Needs," Android Developers Blog, October 21, 2021, https://android-developers.googleblog.com/2021/10/evolving-business-model.html.

[7] ▮▮
▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ See GOOG-PLAY-001291192; GOOG-PLAY-000604733; GOOG-PLAY-003335786.R; GOOG-PLAY-003331764.

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these two groups of developers. I apply the same estimation approach as discussed above for subscription SKUs.

B.   Data

5.   In my econometric analysis of pass-through, I use Google Play transactions data for paid downloads, IAPs, and subscriptions.[8] The data include all the transactions from consumers whose legal country is the U.S. (hereafter "U.S. consumers") from March 5, 2009 to May 31, 2022. Each transaction record contains information on the purchase date, product type (paid download, IAP, or subscription), list price, net consumer spend, purchase quantity, discounts, Google revenue, and developer payout at the SKU level (as identified by the product ID field).[9] I construct and aggregate the following fields to the SKU-month level.[10]

- Price net of developer discount: This is calculated for each month and SKU by summing (within a SKU and month) the total net consumer spend and total Google discounts, and then dividing the result by the total sales quantity.[11] This captures the price that is net of discounts provided by the developer.

- Service fee rate: This is calculated for each month and SKU as the total Google revenue divided by the total gross consumer spend.[12, 13] Based on service fee rates

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[8]   GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

[9]   For paid downloads, each paid app is a unique SKU. For IAPs and subscriptions, each IAP or subscription item is a unique SKU.

[10]   Testing transactions, transactions in non-USD currencies, and transactions with missing or zero list prices are excluded from the analysis. Month-SKU level observations with zero net price are also excluded. Month-SKU level observations with service fee rates being zero or equal to or greater than 30.5% are excluded from the analysis. The excluded month-SKU level observations account for only a negligible fraction of the full sample of month-SKU level observations.

[11]   The amount of discounts offered by Google is computed as the "promotion" amount from Google to consumers (when Google directly provides discounts to consumers) or the "promotion" amount from Google to developers (when Google co-funds discounts with developers). I use the pre-tax amounts for both the net price and the discounts.

[12]   Google's revenue is the service fee amount. I use the pre-tax amounts for both the service fees and the consumer spend.

[13]   Pre-tax gross consumer spend is used to calculate service fee rates.

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at the month-SKU level, prior to July 2021, almost all the month-SKU combinations (>99.9%) for both IAPs and paid downloads were subject to a service fee rate between ███████████ (henceforth, 30%). After the service fee rate reduction on July 1, 2021, ████ of the month-SKU combinations for IAPs and ████ of the month-SKU combinations for paid downloads were subject to a service fee rate between ██████████ (henceforth, 15%).[14]

6.   For the econometric analysis, I use the period from July 2020 to May 2022 (hereafter the "sample period"), with the period prior to the July 1, 2021 rate reduction (hereafter the "pre-period") covering July 2020 to June 2021 and the period after the July 1, 2021 rate reduction (hereafter the "post-period") covering July 2021 to May 2022. I construct the estimation samples for paid downloads, IAPs, and subscriptions respectively by keeping treatment and control units with non-zero sales for all months in the sample period (the "main sample").[15]

7.   As explained above, the treatment and control groups for paid downloads, IAPs, and subscriptions are defined as follows:

	Treatment Group	Control Group
IAPs	Monthly average service fee rate = 30% in the pre period, =15% in the post period	Monthly average service fee rate = 30% in the pre period, =30% in the post period
Paid Downloads	Monthly average service fee rate = 30% in the pre period, =15% in the post period	Monthly average service fee rate = 30% in the pre period, =30% in the post period
Subscriptions	Monthly average service fee rate >= 25% in the pre period, =15% in the post period	Monthly average service fee rate = 15% in the pre period, =15% in the post period

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[14]   Developers paying service fee rates above 15% after the July 2021 service fee policy change could be due to (1) developers not being enrolled in the 15% service fee rate program or (2) the annual cap of $1M USD ($0.5M USD for 2021) was reached. If a developer enrolled in the middle of a month or the annual cap was reached in middle of a month, transactions of SKUs owned by the developer in that month would have been subject to a mixture of 15% and 30% service fee rates, which would yield a blended monthly average service fee rate between 15% and 30%.

[15]   The main sample captures 26%, 33%, and 32% of revenue for IAP, paid downloads, and subscriptions respectively.

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C.   Estimation Results

8.   Table C.1 below displays the estimates of the pass-through rate for paid downloads, IAPs, and subscriptions. The estimates are indistinguishable from zero statistically, i.e., the null hypothesis that the service fee rate reduction has zero average effect on the post-rate change prices – and hence the pass-through rate – is not rejected.

Table C. 1   Estimates of Pass-Through Rate

	IAPs	Paid Downloads	Subscriptions
Pass-Through Rate			
Pass-Through Rate (Upper Bound)			
P-Value			
Number of Treated SKUs			
Number of Control SKUs			
Number of SKU-Month Obs.			
Total Consumer Spend (8/16/16-5/31/22)			
Weighted Average Pass-Through Rate			

Source: Exhibit 5.

9.   As discussed in my report, for various analyses that need an estimate of the service fee pass-through rate, I conservatively use the upper bounds of the 95th confidence intervals for the pass-through rates shown in Table C.1.[16] These upper bounds are ▮ for IAPs, ▮ for paid downloads, and ▮ for subscriptions. Using the total consumer spend for each monetization type during the class period as weights, I calculate the weighted average pass-through rate across the three types of transactions to be ▮

D.   Sensitivity Analyses

a.   Placebo Test

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[16] The 95 percent confidence interval for the pass-through rates is calculated as $\left[-\frac{e^{\widehat{\alpha_R}}-1}{r_c-r_o\times e^{\widehat{\alpha_R}}}, -\frac{e^{\widehat{\alpha_L}}-1}{r_c-r_o\times e^{\widehat{\alpha_L}}} \right]$, where $[\widehat{\alpha_L}, \widehat{\alpha_R}]$ is the 95 percent confidence interval for the ATT estimate $\widehat{\alpha}$.

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10.   I conduct a "placebo" test for paid downloads, IAPs, and subscriptions using the pre-period data. Specifically, I use the time period from July 2020 to June 2021, with the "artificial" pre-period from July 2020 to February 2021 and the "artificial" post-period from March 2021 to June 2021. The SKUs in the control group and the treatment group are kept same. A finding of an effect statistically indistinguishable from zero would provide support for the proposition that the methodology I use constructs the proper synthetic control. The results in Table C.2 show that in fact, the estimates are not statistically significantly different from zero.

Table C. 2   Placebo Test for Pass-Through Rate Estimation

	IAPs	Paid Downloads	Subscriptions
Pass-Through Rate			
P-Value			
Number of Treated SKUs			
Number of Control SKUs			
Number of SKU-Month Obs.			

Source: Exhibit C1.

b. Subsamples by Revenue

11.   There are a large number of SKUs with low levels of revenue in the monthly transactions data. To test whether the estimation results are driven by these SKUs, I run the analysis on the subset of SKUs remaining after removing SKUs with low levels of revenue. Specifically, I remove SKUs in both the treatment and control groups that have cumulative monthly revenue during the sample period (June 2020 to May 2022) in the bottom one percentile. For paid downloads, the remaining SKUs account for 97% of the total number of treatment and control group SKUs in the main sample; for IAPs, the remaining SKUs account for 55% of the SKUs in the main sample. The results based on the subsample of SKUs with revenue in the top 99 percentile are similar to the results using the full sample, as shown in Table C.3.

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Table C. 3   Pass-Through Rate Estimation based on Subsamples by Revenue

	IAPs	Paid Downloads
Pass-Through Rate		
P-Value		
Number of Treated SKUs		
Number of Control SKUs		
Number of SKU-Month Obs.		

Source: Exhibit C2.

c. Shorter Post-Treatment Period

12.   I test the robustness of the results for paid downloads and IAPs by using a shorter treatment period from July 2021 to December 2021, to separate any potential confounding effect of the January 2022 subscription service fee rate reduction on the prices of paid downloads or IAPs. The results based on the shorter treatment period for paid downloads and IAPs are similar to the results based on using the full treatment period, as shown in Table C. 4.

Table C. 4   Pass-Through Rate Estimation based on A Shortened Treatment Period

	IAPs	Paid Downloads
Pass-Through Rate		
P-Value		
Number of Treated SKUs		
Number of Control SKUs		
Number of SKU-Month Obs.		

Source: Exhibit C3.

d. Subsamples Based on the Treatment Group SKUs Having Low Revenue Share of Their Respective Categories

13.   I test whether there is empirical support for the claim that the negligible service fee pass-through I found was due to the SKUs in the control group lowering their prices to compete with SKUs in the treatment group that lowered their prices. I use a subset of the data based on SKUs in app categories where the treatment units make up only a relatively small percentage of the category's total consumer spend (<=10% for IAPs, and <=40% for paid downloads). The results

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based on these subsamples are similar to the results using the full main sample, as shown in

Table C.5 – the pass-through rate estimates are still small and not statistically significantly

different from zero.

Table C. 5   Pass-Through Rate Estimation

Based on Subsamples with Low Treatment Group Revenue Share

	IAPs	Paid Downloads
Pass-Through Rate		
P-Value		
Number of Treated SKUs		
Number of Control SKUs		
Number of SKU-Month Obs.		

Source: Exhibit C4.

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APPENDIX D

PASS-THROUGH RATE FORMULA UNDER THE LOGIT DEMAND MODEL

1.   Dr. Singer defines the pass-through rate as the "ratio of the dollar change in a developer's profit-maximizing price resulting from a one-dollar change in marginal cost."[1] Dr. Singer's formula erroneously considers Google Play's service fee as per-unit cost, rather than *ad valorem* cost.   Specifically, Dr. Singer's pass-through is calculated as $\frac{\partial P}{\partial T}$, where P is the app price set by an app developer and T is the per-unit cost that does not depend on the price P.

2.   The correct way to set up app developers' profit-maximizing pricing from change in service fee rate is to ask the question "how the service fee *rate* change would affect the profit-maximizing price." That is, the correct calculation would be based on $\frac{\partial P}{\partial t}$, where P is the app price set by an app developer and t is the service fee rate. To make the formula more comparable to Singer's pass-through formula where both the numerator and denominators are changes in dollar amounts, the corrected formula to consider is $\frac{\partial P}{\partial t} \frac{1}{P}$.

3.   Below I first show the correct pass-through rate formula under Dr. Singer's logit demand model. The correct formula makes it clear that the pass-through rate of the service fee rate depends on the per unit marginal cost, a critical insight that Dr. Singer ignores. I then formally show why Dr. Singer's formula is incorrect for the reason explained above.

A. Pass-Through Rate Formula Under the Logit Demand Curve

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[1]   Singer Report ¶ 360.

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4.   I show below the pass-through formula under the logit demand model that Dr. Signer chose to use, when correctly considering the service fee as an ad valorem cost (rather than a per-unit cost independent from app price change).

5.   Under the *ad valorem* service rate, a developer's profit function is:

$$\pi = Q(P) \times (P - P \times t - C) = Q(P) \times (P(1-t) - C) \tag{A.1}$$

where Q is sales quantity, P is app price, t is service fee rate, and C is developer's non-service fee fixed per unit marginal cost. If the app developer maximizes profit by choosing app price as Dr. Singer assumes, the first order condition is:

$$\frac{\partial \pi}{\partial P} = \frac{\partial Q}{\partial P}(P(1-t) - C) + Q(1-t) = 0 \tag{A.2}$$

6.   Under a logit demand model, any app developer j's market share $S_j = \frac{Q_j}{M}$ follows the below functional form, where M is the total sales quantity for all the app developers in the market, i.e., market size:

$$S_j = \frac{e^{(\delta_j + \alpha P_j)}}{\sum_i e^{(\delta_i + \alpha P_i)}}, S_0 = \frac{1}{\sum_i e^{(\delta_i + \alpha P_i)}} \tag{A.3}$$

$$\text{Hence } \frac{S_j}{S_0} = e^{(\delta_j + \alpha P_j)}, \ln\left(\frac{S_j}{S_0}\right) = \delta_j + \alpha P_j$$

where α is the price sensitivity of the consumers in the logit demand function and S_0 is the market share of outside goods.[2] Hence, the demand curve slope $\frac{\partial Q_j}{\partial P_j}$ can be derived as:

$$\frac{\partial Q_j}{\partial P_j} = Q_j \frac{\partial \ln(Q_j)}{\partial P_j} = Q_j \frac{\partial \left(\ln(M) + \ln\left(e^{(\delta_j + \alpha P_j)}\right) - \ln\left(\sum_i e^{(\delta_i + \alpha P_i)}\right) \right)}{\partial P_j}$$

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[2]   Also see Singer Report, ¶348.

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$$\frac{\partial Q_j}{\partial P_j} = Q_j\left(\alpha - \frac{\partial ln\left(\sum_i e^{(\delta_i + \alpha P_i)}\right)}{\partial P_j}\right) = Q_j\left(\alpha - \frac{1}{\sum_i e^{(\delta_i + \alpha P_i)}}\frac{\partial e^{(\delta_j + \alpha P_j)}}{\partial P_j}\right)$$

$$\frac{\partial Q_j}{\partial P_j} = Q_j\left(\alpha - \frac{\alpha e^{(\delta_j + \alpha P_j)}}{\sum_i e^{(\delta_i + \alpha P_i)}}\right) = Q_j(\alpha - \alpha S_j) = \alpha Q_j(1 - S_j) \tag{A.4}$$

and

$$\frac{\partial S_j}{\partial P_j} = \frac{1}{M}\frac{\partial Q_j}{\partial P_j} = \alpha S_j(1 - S_j) \tag{A.5}$$

Substituting equation (A.4) into equation (A.2), the profit maximization condition becomes:

$$\alpha(1 - S)(P(1 - t) - C) + (1 - t) = 0$$

$$\alpha(1 - S)\left(P - \frac{C}{1 - t}\right) + 1 = 0 \tag{A.6}$$

Taking derivative with respect to t on both sides of equation (A.6):

$$\alpha(1 - S)\left(\frac{\partial P}{\partial t} - \frac{C}{(1 - t)^2}\right) - \alpha\left(\frac{\partial S}{\partial P}\frac{\partial P}{\partial t}\right)\left(P - \frac{C}{1 - t}\right) = 0 \tag{A.7}$$

Combining equations (A.5) and (A.7) gives the corrected pass-through rate formula:

$$\frac{\partial P}{\partial t} = (1 - S)\frac{C}{(1 - t)^2} = \frac{M - Q}{M} \times \frac{C}{(1 - t)^2} \tag{A.8}$$

and

$$\frac{\Delta P}{(t + \Delta t)(P + \Delta P) - tP} \approx \frac{\partial P}{\partial t}\frac{1}{P} = (1 - S)\frac{C/P}{(1 - t)^2} = \frac{M - Q}{M} \times \frac{C}{P(1 - t)^2} \tag{A.9}$$

7. Note that the per unit marginal cost C appears in this correct pass-through rate formula.

Consequently, the pass-through rate of the service fee rate tends toward zero as app developers'

non-service fee marginal cost amount (C) tends toward zero.

B. Dr. Singer's Incorrect Pass-Through Rate Formula

8. Dr. Singer, instead, defines an app developer's profit is defined as:

$$\pi = Q(P) \times (P - T - C) \tag{A.10}$$

where T is an additional fixed per-unit cost (analogous to the service fee-based cost $P \times t$), which critically does not depend on the price P. This is the crucial difference between (A.1) and (A.10). Under this wrong characterization of the service fee, the first order condition becomes:

$$\frac{\partial \pi}{\partial P} = \frac{\partial Q}{\partial P}(P - T - C) + Q = 0 \tag{A.11}$$

Substituting equation (A.4) into equation (A.11), the profit maximization condition becomes:

$$\alpha(1 - S)(P - T - C) + 1 = 0 \tag{A.12}$$

Taking derivative with respect to T on both sides of equation (A.12):

$$\alpha(1 - S)\left(\frac{\partial P}{\partial T} - 1\right) + \alpha\left(-\frac{\partial S}{\partial P}\frac{\partial P}{\partial T}\right)(P - T - C) = 0 \tag{A.13}$$

Substituting equation (A.12) into equation (A.13) leads to

$$(1 - S)\left(\frac{\partial P}{\partial T} - 1\right) - \alpha S(1 - S)(P - T - C)\left(\frac{\partial P}{\partial T}\right) = 0 \tag{A.14}$$

Combining equations (A.5) and (A.14) leads to Dr. Singer's pass-through rate formula[3]:

$$\frac{\partial P}{\partial T} = 1 - S = \frac{M - Q}{M} \tag{A.15}$$

9.   This formula no longer depends on the per unit marginal cost and is wrong for the reason explained above.

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[3]   Singer Report ¶¶358-360.

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APPENDIX E

Technical Appendix

I.   DR. RYSMAN'S DAMAGES CALCULATIONS DEPEND CRUCIALLY ON TWO (AND ONLY TWO) INPUTS

1.   Dr. Rysman provides the expression for consumer damages (the change in income for consumers to be at the same welfare level in the actual world as in the but-for) in Eq. 10 of Appendix F of his report:

(1) $\Delta y = y \left[\dfrac{\left(\frac{(1-\tau_2)}{(1-t_2)} \cdot \frac{y}{F} - 1 \right) \left(\frac{(\rho-1)(1-\tau_2)}{(1-t_2)} \cdot \frac{y}{F} + 1 \right)^{\rho-1}}{\left(\frac{(1-\tau_1)}{(1-t_1)} \cdot \frac{y}{F} - 1 \right) \left(\frac{(\rho-1)(1-\tau_1)}{(1-t_1)} \cdot \frac{y}{F} + 1 \right)^{\rho-1}} - 1 \right]$

2.   Because the value Dr. Rysman uses for consumer expenditure (y) is over two million times his estimate of the fixed cost of entry (F), this expression is approximately (with over 99.999% accuracy) equal to[1]:

(2) $\Delta y = y \left[\left(\frac{1-\tau_2}{1-\tau_1} \cdot \frac{1-t_1}{1-t_2} \right)^{\rho} - 1 \right]$

3.   Therefore, Dr. Rysman's consumer damages calculation depends crucially on two (and only two) inputs to his model: (1) the value of the model parameter, ρ, which relates to the

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[1]   One could obtain this same equation making the simplification assumption that apps do not consider the effect of their individual prices on the market price index (as that effect goes to zero as the number of apps becomes large). Rysman Report, Appendix F, p. F-4, fn. 7.

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elasticity of app demand and, given the restrictiveness of Dr. Rysman's chosen demand system, the cross elasticity of demand between apps, and (2) the but-for fee.

4.   Dr. Rysman's consumer damages calculation is very sensitive to these inputs.   Dr. Rysman's value for ρ is based on the Ghose and Han (2014)[2] estimate of app-level elasticity of demand.   Using the reported results in Ghose and Han (2014), the 95% confidence interval for their estimate of the elasticity demand is [-4.601,-2.861].   At the high end of this range (in absolute value), the implied value of ρ is 1.278.   The consumer damages calculated using Dr. Rysman's model, but with this value of ρ, are 7.3%, or ███████████, than Dr. Rysman's calculation based on $\rho = 1.367$.

5.   A further problem with Dr. Rysman's use of the Ghose and Han estimate is that, while Ghose and Han estimated the elasticity for *only* the top 400 paid apps[3], Dr. Rysman applied this elasticity to *all* paid apps.   Dr. Rysman's extrapolation of the elasticity for the top 400 paid apps to all paid apps is flawed because, under the logit model that Ghose and Han use, the own elasticity of demand for an app is negatively related (in absolute value) to the app's share.   Thus, the paid apps that Ghose and Han excluded from their estimation, which by definition were of smaller share than the paid apps they included, would have larger (in absolute value) own elasticities of demand than the top 400 paid apps.   This in turn means that Dr. Rysman should have adjusted the Ghose and Han elasticity of demand upward (or, equivalently, ρ downward) before using it as the elasticity of demand for all paid apps.

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[2]   A. Ghose and S. Han, "Estimating demand for mobile applications in the new economy," *Management Science*, 60 (2014), pp. 1470-1488.

[3]   Ghose and Han, p. 1471. They also include the top 400 free apps in their analysis. Dr. Rysman, in contrast, ignores free apps entirely.

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6.   For example, in the context of Dr. Rysman's model where apps all have the same quality, the top 400 apps could have higher share only by having a lower price. The elasticity of demand for app i in a logit setting is $e_i = -\beta p_i(1 - s_i)$ where β is the price coefficient, p_i is the price of app i and s_i is the share of app i. Because the share of even a top 400 app is small, $e_i \approx -\beta p_i$. In the logit context, the log of the ratio of shares of two apps is $\ln\left(\frac{s_1}{s_2}\right) = -\beta(p_1 - p_2) \approx e_1 - e_2$. The share of a top 400 app is about 20 times the share of a non-top 400 app.[4] Thus, the elasticity of demand of a non-top 400 app would exceed that of a top 400 app (in absolute value) by 3 ($\ln(20) \approx 3$). So, if the elasticity of demand of a top 400 app is -3.731, the elasticity of demand for a non-top 400 app would be -6.731 on average. Taking a weighted average of these two elasticities using revenue shares (calculated based on the quantity shares and the prices implied by those shares) of the top 400 apps and non-top 400 apps, respectively, as weights yields an overall average elasticity of -6.729. Had Dr. Rysman used this figure instead of -3.731, his variety consumer damages would be reduced by 53.2% and his combined variety/overcharge damage would be reduced by 15.6%.

7.   A further problem with Dr. Rysman's use of the Ghose and Han elasticity estimate is that the instruments Ghose and Han used are likely invalid.[5] Accordingly, their estimate is likely biased downward. This, in turn, means that Dr. Rysman's damages calculations are biased upward.

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[4]   Ghose and Han, Table 1, report that the average share of the top 400 apps they included in their analysis to be 0.002%. At the time they collected their data, the Google Play store had about 700 thousand apps. https://www.statista.com/statistics/266210/number-of-available-applications-in-the-google-play-store/.

[5]   T. Armstrong, "Large market asymptotics for differentiated product demand estimators with economic models of supply," *Econometrica*, 84 (2016), pp. 1961-1980 shows that BLP-style instruments are likely invalid in the context of a large number of products each with a very small share, as is the case here. Hausman-style instruments are also likely invalid because demand shocks for an app on iOS are likely to be correlated with demand shocks for the same app on Android.

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II.   THE SERVICE FEE PASS-THROUGH RATE THAT EMERGES FROM DR. RYSMAN'S MODEL DEPENDS ON THE DEMAND SYSTEM THAT THE MODEL ASSUMES

8.   I demonstrate this proposition by example. I replace Dr. Rysman's choice of demand system with an alternative demand system, but otherwise retain the other fundamental aspects of Dr. Rysman's model (many of which are themselves flawed as I discuss elsewhere). I show that the pass-through rate is well below 100% with this alternative demand system assumption.

9.   Suppose that the demand for Android apps is of the "logit" form.[6] Specifically, suppose that demand for Android app i is

$$(3) \qquad q_i = \frac{\exp(-\beta p_i)}{\theta + \sum_{j=1}^{n} \exp(-\beta p_j)}$$

10.   The parameter θ allows the Android app segment to have a non-zero segment elasticity of demand.[7] As in Dr. Rysman's model, I assume the apps are "symmetric," so that, in equilibrium, price and quantity will be the same for each app. In equilibrium, the elasticity of demand for each app will be

$$(4) \qquad e_A = -\beta(1-q)p$$

and the Android app segment elasticity of demand will be

$$(5) \qquad e_S = -\beta(1-nq)p.$$

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[6]   As I discuss in the text of my report, Dr. Singer assumes that demand for apps is of the logit form for certain analyses in his report. By using it in this example, I am not suggesting that logit is the appropriate demand model for Android apps. Rather, I am simply demonstrating that the pass-through rate in Dr. Rysman's model is dependent on his choice of demand system. Given that he performed no empirical analysis to support his particular choice of demand system, Dr. Rysman has no basis to assume 100% pass-through.

[7]   Dr. Rysman's model assumes that the expenditure on apps remains fixed regardless of app pricing. Rysman Report, Appendix F, ¶ 5. This means that as the price of all apps increases by 10%, the total quantity of apps demanded must decrease by approximately 10% to ensure that expenditure on apps remains constant. Put another way, Dr. Rysman is assuming that the segment elasticity for Android apps is -1.

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11.   Given "actual world" values for the app and segment elasticities and p and n, the parameters β and θ can be calibrated by solving equations (4) and (5) after substitution of (3) and imposition of symmetry.[8] As in Dr. Rysman's model, I assume the "actual world" app elasticity to be -3.7, the "actual world" segment elasticity to be -1, and the "actual world" number of apps to be 465,262. The "actual world" price can be assumed to be \$1 without loss of generality.

12.   Based on the FOC for an app's profit maximization problem and symmetry, the equilibrium price for each app is

$$(6) \quad p = \frac{c}{1-\tau} + \frac{1}{\beta(1-q)}$$

Given the calibrated β and θ and the "actual world" values of p, n, and τ (assumed to be 0.29, the value Dr. Rysman used), (6) can be solved for c. Finally, the fixed cost of entry F can be calibrated as

$$(7) \quad F = \big((1-\tau)p - c\big)q$$

where p and τ are at their "actual world" values and q is calculated using (3), the "actual world" values of p and n, and the calibrated values of parameters β and θ.[9]

13.   For Dr. Rysman's but-for world in which n is assumed fixed at its actual level, the but-for value of p can be determined by solving (6) with $\tau = 0.15$ and c, β, and θ set to their calibrated values. I calculate the pass-through rate, defined as

$$(8) \quad PTR = \frac{p_A - p_{BF}}{0.29 p_A - 0.15 p_{BF}}$$

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[8]   The calibrated values of β and θ are 3.7 and 3.0e-7, respectively.

[9]   The calibrated values of c and θ, and F are 0.52, 3.0e-7, and 4260.3.

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to be 76%. For Dr. Rysman's but-for world in which both p and n are allowed to change from their actual levels, the consumer damages ("overcharge" and "variety") are only 21% of consumer expenditure, as opposed to 28% using Dr. Rysman's model.

14.   Thus, if Dr. Rysman had used the logit model instead of the CES model, he would have found a lower service fee pass-through rate and lower damages. As noted above, this is just an illustration of how a different choice of demand system could lead to different results. There are many other demand systems beyond logit and CES that Dr. Rysman could have used.

III.   DR. RYSMAN'S MODEL IGNORES CONSUMER SEARCH COSTS

15.   In his model, Dr. Rysman implicitly assumes consumers have perfect information regarding every app's existence, price, and quality. But, this assumption is not consistent with the real world. For example, one of the forms of value Google Play generates for app developers is "discovery value," i.e., helping apps find a user base among consumers. I show that, in a model that relaxes the perfect information assumption, the pass-through rate can vary widely depending on the model's parameters, so that the "overcharge" damages can be minimal. Moreover, the "variety" effect to which Dr. Rysman attributes substantial damages can also be minimal.

16.   The starting point for this alternative model is that consumers are not aware of each of the millions of apps available in the Google Play store and spend time searching through the store to discover prices, quality, and even the identity of apps available to download. Given the large number of available apps and the opportunity cost of time, most consumers do not search the entire set of available apps, even within a category, to find their most preferred app. Rather, a consumer will discover only a subset of available apps and choose from among that subset. Consumers explore fewer apps before purchasing if it is more costly to discover each one. The higher the cost

of exploring, the fewer apps each consumer explores, and the smaller the subset of apps from which each consumer chooses. With the smaller number of apps in a consumer's choice set, each app faces less competition from other apps and is therefore able to charge a higher margin. A further consequence is that an app would pass through less of a lower but-for service fee.

17.   I use a sequential search model of monopolistic competition with imperfect information.[10] I assume there are n apps, each with marginal cost equal to c. There is a unit mass of consumers. Each consumer j has tastes described by a conditional utility function (net of any search cost) of the form

(9) $u_{ji}(p_i) = -p_i + \epsilon_{ji}$

if she buys app i at price p_i. Parameter ϵ_{ji} is the realization of random variable and can be interpreted as a match value between consumer j and app i, and these match values are assumed to be independent across consumers and apps.

18.   A consumer must incur a search cost s to learn the price charged by any particular app as well as her match value for the app sold by that firm. Consumers search sequentially with costless recall, i.e., after exploring a given app, the consumer decides whether she to pay a search cost s to explore another app in hopes of finding a better match or to stop and purchase the app with the best match among those apps she had explored so far. If she decides to search further, she repeats this process in the next step, deciding whether to stop searching after exploring one more app or continuing to search.

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[10]   S. Anderson and R. Renault, "Pricing, product diversity, and search costs: A Bertrand-Chamberlin-Diamond model," *RAND Journal of Economics*, 30 (1999), pp. 719-735.

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19.   Using results for the equilibrium price[11] from Anderson and Renault (1999), one can show

that if the match parameter ϵ is drawn from standard uniform distribution, the equilibrium price

is[12]

(10) $p = \dfrac{c}{1-\tau} - \dfrac{D(p_i,p)}{\frac{\partial D(p_i,p)}{\partial p_i}} = \dfrac{c}{1-\tau} + \dfrac{\sqrt{2s}}{1-(1-\sqrt{2s})^n}$

where n is the overall number of available apps and τ is the service fee. As the search cost s

approaches zero (Dr. Rysman's perfect information assumption), the pass-through rate

approaches 100% as in Dr. Rysman's model for large n and positive marginal cost. If, however,

the search cost is positive, the pass-through rate is strictly less than 100%, decreases in the app's

marginal cost c, and converges to zero as c approaches zero from above. This is true even as n

approaches infinity.

(11) $Pass\ Through = \dfrac{p_2-p_1}{\tau_2 p_2 - \tau_1 p_1} = \dfrac{1}{1+\dfrac{\sqrt{2}\sqrt{s}(1-\tau_1)(1-\tau_2)}{c\left(1-(1-\sqrt{2}\sqrt{s})^n\right)}} \xrightarrow{n\to\infty} \dfrac{1}{1+\dfrac{\sqrt{2}\sqrt{s}(1-\tau_1)(1-\tau_2)}{c}} < 1$

20.   In addition, the variety effect in this model would be negligible as long as the large majority

of consumers reach their optimal stopping point on app search short of n in the actual world. For

such a consumer, increasing n in the but-for world would have no effect on their welfare (holding

app prices constant); that is, there is no significant "variety" effect in this model. Only a consumer

who, in the actual world, explored all n apps and would have been willing to incur the search cost

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[11]   Anderson and Renault, p. 723, equation 7.

[12]   I use the assumption of a uniform distribution here so that the solution is of closed form, but the basic results
hold for any distribution of the match parameter with a log-concave and continuously differentiable density f
whose support is an interval [a, b] of the extended real line as shown by Anderson and Renault.

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to explore at least one additional app (if available) would have benefited from additional apps in the but-for world. However, very few consumers, if any, explore all n apps.

IV.   DR. RYSMAN'S MODEL IGNORES APP DIRECT NETWORK EFFECTS

21.   Network effects are often broken down conceptually into two different types: direct and indirect. Direct network effects occur when the value of a product or service increases with the number of users or amount of usage because the network is larger. Indirect network effects, on the other hand, occur when a platform has two or more user groups, such as app developers and consumers in the case of Google Play. As more apps are available in the Google Play store, consumers receive a greater value from the store. Dr. Rysman's model ignores the direct network effects and focuses only on the indirect network effect associated with greater "variety."

22.   I address this issue by augmenting Dr. Rysman's model to account for the situation where a consumer's value from an app depends on the amount of usage of the app by other consumers. Direct network effects are likely to be important for many apps, such as dating apps and games, for example. With the introduction of direct network effects to the model, a consumer's utility from using an app increases if the usage of the app by other consumers increases. Now consider the experiment Dr. Rysman runs to calculate consumer damages. He asks how much more budget would have to be given to consumers to spend on apps in the actual world to make them as well off as they would have been in the but-for world. When his model is augmented to account for direct network effects, a given increase in budget in the actual world would have led to more expenditure on the apps that existed in the actual world and thus more usage of those apps. This increase in usage would, through the direct network effects, increase the quality of the apps that existed in the actual world, and the higher app quality would have benefited consumers. Thus, in

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the augmented Rysman model with direct network effects, a smaller budget increase in the actual world would have been required to make consumers as well off as in the but-for world than in the original, unaugmented Rysman model that does not take direct network effects into account. Because this budget increase is Dr. Rysman's measure of consumer damages, the augmented model with direct network effects produces lower consumer damages than Dr. Rysman's original model.

23.   Dr. Rysman assumes consumers have the following CES utility function:

(12) $u = \left(\sum_{i=1}^{n} (a_i q_i)^{\frac{1}{\rho}} \right)^{\rho}$

With this utility function, consumer welfare increases in equilibrium as the number of firms on the market increases ceteris paribus. However, this utility function does not incorporate the fact consumer welfare also increases if a greater number of other consumers use the same app (direct network effects). To add direct network effects into the model, I assume that an app's quality a_i is proportional to the equilibrium usage of the app by consumers, i.e., $a_i = \hat{q}_i^r$ $\forall i$, where $0 \leq r < \rho - 1$ allows for varying strength of the direct network effect. The case of $r = 0$ corresponds to Dr. Rysman's model.

24.   I assume that each individual consumer does not internalize her effect on the app's quality; hence each individual consumer perceives the app's quality $a_i = \hat{q}_i^r$ as fixed.[13]   As in Dr.

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[13]   Due to the large number of consumers, the impact of each individual consumer on the app's quality is negligible. Moreover, each individual consumer does not derive any direct network effect value from the fact that she herself uses the app. As a result, if the consumer decides to purchase and use the app, it does not change the app's quality for that consumer per se, while still increasing the quality of the app (slightly) for all other consumers purchasing it.

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Rysman's model, the consumer optimization problem leads to the demand for app i being given by:

$$(13) \quad q_i = \frac{y}{1-t} \cdot \frac{(a_i \bar{p})^{\frac{1}{\rho-1}}}{p_i^{\frac{\rho}{\rho-1}}} = \frac{y}{1-t} \cdot \frac{(\hat{q}_i^r \bar{p})^{\frac{1}{\rho-1}}}{p_i^{\frac{\rho}{\rho-1}}}$$

$$\text{where } \bar{p} = \left(\sum_{i=1}^{n} \left(\frac{p_i}{a_i} \right)^{\frac{1}{1-\rho}} \right)^{1-\rho} = \left(\sum_{i=1}^{n} \left(\frac{p_i}{\hat{q}_i^r} \right)^{\frac{1}{1-\rho}} \right)^{1-\rho}$$

25.   Unlike consumers, developers do internalize that consumers prefer apps that a higher number of other consumers use, i.e., apps with higher demand q_i. As a result, each firm sees its app's quality $\hat{q}_i^r$ not as a constant but as a function of its demand, and hence have an additional incentive to lower the price to attract more consumers since it would increase the app's quality and attracts even more consumers. As a result, according to equation (13), the firm's demand equals

$$(14) \quad q_i = \hat{q}_i = \left(\frac{y}{1-t} \right)^{\frac{\rho-1}{\rho-r-1}} \cdot \frac{\bar{p}^{\frac{1}{\rho-r-1}}}{p_i^{\frac{\rho}{\rho-r-1}}}$$

26.   Each developer i sets the price of its app p_i to maximize its profit

$$(15) \quad \pi_i = \left((1-\tau)p_i - c \right) \cdot q_i = \left((1-\tau)p_i - c \right) \cdot \left(\frac{y}{1-t} \right)^{\frac{\rho-1}{\rho-r-1}} \cdot \frac{\bar{p}^{\frac{1}{\rho-r-1}}}{p_i^{\frac{\rho}{\rho-r-1}}}$$

To get a more tractable solution, I make the assumption that each developer does not internalize the effect of their price on market price index $\bar{p}$.[14] As a result, the equilibrium price and quantity can be expressed as:

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[14]   Dr. Rysman references this same assumption. Rysman Report, Appendix F, fn. 7. This assumption can be easily relaxed, leading to the equilibrium price expression $\hat{p} = \frac{\rho n - 1}{(1+r)n - 1} \cdot \frac{\rho c}{1-\tau}$ and equilibrium number of firms on the

(16) $\quad \hat{p} = \dfrac{\rho c}{(1-\tau)(1+r)}$

(17) $\quad \hat{q} = \dfrac{y}{(1-t)n\hat{p}} = \dfrac{y(1-\tau)(1+r)}{(1-t)\rho c} \cdot \dfrac{1}{n}$

27. One also can show that under the assumption that firms do not internalize their effect on market price index $\bar{p}$, the equilibrium number of firms on the market is given by:

(18) $\quad n = \dfrac{y(1-\tau)(\rho-r-1)}{(1-t)\rho F}$

Plugging the above expression for equilibrium price and number of firms on the market into the utility function yields:

(19) $\quad u = \left(\sum_{i=1}^{n}(a_i q_i)^{\frac{1}{\rho}}\right)^{\rho} = \left(\sum_{i=1}^{n}(\hat{q}^{1+r})^{\frac{1}{\rho}}\right)^{\rho}$

$\qquad = \left(n \cdot \hat{q}^{\frac{1+r}{\rho}}\right)^{\rho} = n^{\rho} \cdot \hat{q}^{1+r} = n^{\rho-r-1}\left(\dfrac{y}{(1-t)\hat{p}}\right)^{1+r}.$

Using the same approach as Dr. Rysman, the change in budget in the actual world required to make consumers as well off in the actual world as in the but-for world, Δy, is given as the solution for:

(20) $\quad n_1^{\rho-r-1}\left(\dfrac{y+\Delta y}{(1-t_1)\hat{p}_1}\right)^{1+r} = n_2^{\rho-r-1}\left(\dfrac{y}{(1-t_2)\hat{p}_2}\right)^{1+r}$

Solving (20) for Δy yields:

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market $n = \dfrac{1+\frac{y(1-\tau)(\rho-r-1)}{(1-t)F}}{\rho}$. When the number of firms on the market n and consumer budget y is large, the model's predicted market outcomes with more and less relaxed assumptions are very similar.

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$$(21) \quad \Delta y = y \cdot \left[\left(\frac{\hat{p}_1(1-t_1)}{\hat{p}_2(1-t_2)} \right) \cdot \left(\frac{n_2}{n_1} \right)^{\frac{\rho-r-1}{1+r}} - 1 \right] = y \cdot \left[\underbrace{\left(\frac{\hat{p}_1(1-t_1)}{\hat{p}_2(1-t_2)} \right)}_{\substack{overcharge \\ effect}} \cdot \overbrace{\left(\frac{n_2}{n_1} \right)^{\rho-1}}^{variety\ effect} \cdot \underbrace{\left(\frac{n_2}{n_1} \right)^{-\frac{\rho r}{1+r}}}_{\substack{direct \\ network\ effect}} - 1 \right]$$

Plugging equations (16) and (18) for prices and number of firms, respectively, into (21) and simplifying, yields:

$$(21) \quad \Delta y = y \cdot \left[\left(\frac{(1-\tau_2)(1-t_1)}{(1-\tau_1)(1-t_2)} \right)^{\frac{\rho}{1+r}} - 1 \right]$$

$$= y \cdot \left[\underbrace{\left(\frac{(1-\tau_2)(1-t_1)}{(1-\tau_1)(1-t_2)} \right)}_{\substack{overcharge \\ effect}} \cdot \overbrace{\left(\frac{(1-\tau_2)(1-t_1)}{(1-\tau_1)(1-t_2)} \right)^{\rho-1}}^{variety\ effect} \cdot \underbrace{\left(\frac{(1-\tau_2)(1-t_1)}{(1-\tau_1)(1-t_2)} \right)^{-\frac{\rho r}{1+r}}}_{\substack{direct \\ network\ effect}} - 1 \right]$$

For reference, the expression that does not account for direct network effects is:

$$(22) \quad \Delta y = y \cdot \left[\left(\frac{(1-\tau_2)(1-t_1)}{(1-\tau_1)(1-t_2)} \right)^{\rho} - 1 \right] = y \cdot \left[\underbrace{\left(\frac{(1-\tau_2)(1-t_1)}{(1-\tau_1)(1-t_2)} \right)}_{\substack{overcharge \\ effect}} \cdot \overbrace{\left(\frac{(1-\tau_2)(1-t_1)}{(1-\tau_1)(1-t_2)} \right)^{\rho-1}}^{variety\ effect} - 1 \right]$$

Using the values for $\tau_1, \tau_2, t_1, t_2,$ and ρ used by Dr. Rysman, I find that the direct effect entirely offsets the indirect effect as the level of the direct effect, r, approaches the value of $\rho - 1 = 0.37.$[15] In that case, "variety"-only damages are zero and combined overcharge/variety damages

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[15]   Because Ghose and Han controlled for factors related to number of users of an app in their econometric analysis, their elasticity estimate represents the effect of price holding the direct network effect constant and therefore this estimate can still be used to calculate ρ (subject to the other issues I have identified).

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are calculated to be only 19.8% of consumer spending on apps, compared to 28.0% of consumer spending as claimed by Dr. Rysman.

V. DR. RYSMAN'S MODEL FAILS TO PROPERLY REFLECT THE NATURE OF PRODUCT DIFFERENTIATION AMONG APPS

28.   Dr. Rysman's model assumes that all paid Android apps compete equally with each other. However, as discussed in the text of my report, this assumption is incorrect—Android apps vary in the nature of the functionality they provide users. As a result, an Android app does not compete equally with all other Android apps. Rather, it competes more closely with other apps that offer similar functionality than with apps that offer different functionality. Dr. Rysman could have used a "nested" CES model to capture this market reality. In such a model, products that compete closely with each other are grouped into a "nests." For example, weather apps might be grouped together into a nest because, given they are providing similar functionality, they might be expected to compete more closely with each other than with apps providing different types of functionality. In a nested CES model, there are multiple consumer preference parameters rather than just one. In the simplest version (which, as with Dr. Rysman's non-nested model, is likely to miss important complexities of the real world marketplace), there would be a parameter representing consumer preferences for variety *among* nests and a parameter representing consumer preferences for variety among apps *within* a nest.

29.   It is reasonable to suppose that the consumer preference for variety among nests would be larger than the consumer preference for variety of apps within a nest. For example, consider the weather apps. Adding an additional weather app, once multiple weather apps already existed, is likely to be less important to consumers than adding the first weather app (which would create the weather app nest) to the list of existing nests.

30.   At the same time, the proposition that entirely new types of apps (i.e., nests) that never existed before would have been invented in the but-for world seems unlikely and certainly Dr. Rysman provides no support for it.[16] Rather, any new entry likely would have been limited to new apps within existing nests. However, as noted above, adding additional apps to existing nests is likely to be of relatively limited value to consumers.

31.   In addition, if Dr. Rysman's model is generalized to allow for nests, in principle all of the model parameters may differ by nest. For example, some nests may have a lower fixed cost of entry than others, or a different app own elasticity of demand. Differences in parameters across nests could lead to a different number of apps per nest in the actual world (an outcome that would be consistent with the real world). Nests with a relatively small number of apps may not be able to accommodate the amount of entry that the simpler version of Dr. Rysman's model predicts (due to the "integer problem" that the simpler version ignores[17]). In that case, the "variety" damages would be less than Dr. Rysman's model calculates.

VI.   DR. RYSMAN'S MODEL INCORRECTLY ASSUMES THAT APPS ARE SYMMETRIC

32.   Dr. Rysman assumes in his model that apps are symmetric—all apps are assumed to have the same marginal cost, the same demand function, and, within the demand function, a quality

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[16] If creating a new type of app that was valuable to consumers was economically feasible, we would have expected to have already seen it occur in the actual world. Developers would have a strong incentive to create such a new type of app given that it would be the only seller of the new type, at least initially, and would have a first-mover advantage even if other developers entered subsequently. The profit opportunity involved in creating a new type of app that was of value to consumers would be greater than the profit opportunity involved in entering an existing nest. Thus, it should have already occurred in the actual world or the costs of creating a new type of app far exceed the costs of creating a new app for an existing nest.

[17] Rysman Report, Appendix F, ¶ 13.

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parameter equal to 1.[18] He claims that his symmetry assumptions are justified because "ex ante"—at the time the app's price is set, but before the app is actually introduced on the marketplace—the developer has no idea as to what the app's marginal cost or quality will be and thus all apps can be thought of as the same (symmetric) when the price is seg. In the text of the report, I discuss why this claim of ex ante symmetry is inconsistent with real world market facts. However, even taking Dr. Rysman's claim of ex ante symmetry as given, it does not allow Dr. Rysman to derive the tractable equations on which he bases his damages calculations. Rather, Dr. Rysman makes an unjustified leap in his derivation.

33.   To start, Dr. Rysman is not clear as to what information he is assuming an app developer has when setting its price. For example, the expectations operator appears in the equation in Rysman Report Appendix F ¶ 8. Although Dr. Rysman does not specify, presumably the developer is taking expectations over the joint distribution of the quality parameters a_i for all apps. However, Dr. Rysman does not say whether the developer is assumed to know that ex ante symmetry among apps prevails, what the joint distribution of the a_i is, or whether all developers have knowledge of that distribution. Nor does Dr. Rysman explain why the marginal cost is assumed to be deterministic (and the same for all apps) in this equation, especially given that he later attempts to justify the symmetry of marginal cost along the same lines as the app quality.

34.   After some manipulation, Dr. Rysman arrives at the equation in Rysman Report, Appendix F, ¶ 11. Then, in the first sentence of Rysman Report, Appendix F, ¶ 12, he states "Let $a_i = 1 \ \forall i$."

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[18] In Dr. Rysman's model, the parameter a_i can be thought of as a parameter reflecting the relative quality of app i (Rysman Report, Appendix F, ¶ 4). If all apps have the same quality parameter, they all have the same relative quality. Dr. Rysman goes further and assumes the quality parameter is equal to 1 for all apps. This is harmless in his main model, but has the curious (and unsupported) implication that apps are of the same "quality" as the numeraire good in the version of his model where he incorporates an "outside good."

However, this assumption that all apps have quality parameter equal to 1 is not an implication of the equation in Rysman Report, Appendix F, ¶ 11, nor is it a harmless assumption. In fact, it is valid only if the second expectation in the equation in Rysman Report, Appendix F, ¶ 11 is equal to $1/n^2$. However, the second expectation is not equal to $1/n^2$ in general and evaluating it requires knowledge of the joint distribution of the a_i. Thus, contrary to Dr. Rysman's claim, the "ex ante symmetry" assumption does not allow him to assume that $a_i = 1 \ \forall i$ and thereby reach his tractable formulas. Rather, the way he reaches those tractable formulas is to assume that apps are *ex post* symmetric in that they are all known to have the same value of 1 for the quality parameter. Rather than be upfront about this assumption—likely because it is obviously untenable—Dr. Rysman attempts a sleight of hand by making an unjustified leap from the equation in Rysman Report, Appendix F, ¶ 11 to the equation in Rysman Report, Appendix F, ¶ 12. But, as Rysman Report, Appendix F, ¶ 11 makes clear, even with ex ante symmetry, the modeler (and the developer being modeled) requires knowledge of the joint distribution of the a_i.

35.   In any event, Dr. Rysman's assumption of ex ante symmetry is incorrect. Once developers are allowed to be asymmetric, i.e., when a developer setting its price is allowed to have some information regarding its app's demand or marginal cost, applying Dr. Rysman's (incorrect) symmetric model can lead to substantial errors. Again, I demonstrate this by example. I first construct a "real world" in which there is asymmetry. I then see what happens if Dr. Rysman's symmetric model is incorrectly applied to this "real world."

36.   To construct the "real world," I assume there is a unit mass of consumers with an aggregate budget equal to one and there are 11 apps on the market with $\tau = 0.3$. I assume demand for apps in the "real world" is governed by the demand system used in Dr. Rysman model, except that instead of each app having quality parameter equal to 1, the 11 apps have quality parameters $a_1 =$

$1.5, a_2 = 1.4, \ldots, a_{11} = 0.5$.   There are three developers who chose not to enter when $\tau = 0.3$.

Had they entered, these developers' apps would have had quality parameters $a_{12} = 0.4, a_{13} =$

$0.3, a_{14} = 0.2$.   The demand parameter ρ is set to the same value as that used by Dr. Rysman.

37.   Each developer with an app on the market chooses its price to maximize its profits.   The

set of equilibrium prices in the "real world" jointly solve the developers' first order conditions.

Because the quality parameters are not the same across apps, the "real world" equilibrium prices

and demands are not the same across apps, unlike in the Rysman model.   The fixed cost of entry

in the "real world" is set so that the profit of the least profitable of the 11 apps on the market is

zero.   If app #12 (with quality parameter $a_{12} = 0.4$) entered, it would have negative profitability

and thus it would not enter in equilibrium.[19]

38.   I next ask what would happen in this constructed "real world" if the commission rate were

decreased to $\tau = 0.15$.   While the profit of each of the 11 apps on the market would increase, if

app #12 entered, its profitability would still be negative.   Thus, despite the lower commission rate,

there would be no additional variety in the "real world" with quality asymmetry.   The reason for

this is that the apps that did not enter with the higher commission rate are those with relatively low

quality.   Even with the lower commission rate, they are not profitable because of their lower

quality.   There is a "selection problem"—the apps that entered are of higher average quality than

the apps that did not enter.

39.   An important implication of this is that, with quality asymmetry, one must analyze the

quality of the apps that did not enter to determine what would happen with a lower commission

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[19]   Multiple equilibria may be possible in this type of model. However, I focus on the most "efficient" equilibrium in which the apps that do not enter in equilibrium have lower quality than all the apps that do enter in equilibrium. I also focus on equilibria in pure strategies.

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rate. Generally, analyzing the quality of products that never entered is difficult. Dr. Rysman's symmetry assumption allows him to avoid this difficulty. With symmetry, the quality of the apps that did not enter is the same as the quality of apps that did enter. There is no "selection problem." Thus, inferences about what would happen with a lower commission rate can be made just by looking at the apps that did enter. While assuming symmetry makes the analysis easier, it leads the analysis astray if apps are actually asymmetric.

40.   To show that, I apply the symmetric Rysman model to the asymmetric "real world" I constructed above. The symmetric Rysman model incorrectly predicts that two additional apps would enter with the lower commission rate. It does so because it incorrectly assumes that the apps that did not enter at the higher commission rate were of the same average quality as the apps that did enter. It also overstates the variety damages because, even if two additional apps entered with the lower commission rate, they would be of below average quality and thus provide less additional utility to consumers than the 11 original apps.

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Exhibit 1a

Price Changes of the Top 100 Paid Apps
With A Flat Service Fee Rate Reduction of 15 Percentage Points After July 2021

July 2020 – June 2021 vs. July 2021 - May 2022

	Total	No Price Change	Price Increase	Price Decrease
Based on List Price				
Count of SKUs	100			
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average List Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% List Price Change				
Based on Net Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average Net Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% Net Price Change				

Notes:

[1] The analysis considers the top 100 paid apps ranked by total consumer spend during July 2020 and May 2022 among paid apps with non-zero sales in every month between July 2020 and May 2022, subject to a 30% service fee rate in every month between July 2020 and June 2021 and a 15% service fee rate in every month between July 2021 and May 2022.

[2] Service fee rates are first calculated at SKU-level for the pre-/post-period as the total gross Google service fee revenue divided by the total gross consumer spend in the period. The average service fee rate in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period service fee rates.

[3] List prices are first calculated at SKU-level in the pre-/post-period as the total gross consumer spend divided by the total quantity purchased in the period. The average list price in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period list prices.

[4] Net prices are first calculated at SKU-level in the pre-/post-period as the total gross consumer spend net of developer-offered discounts divided by the total quantity purchased in the period. The average net price in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period net prices.

[5] Price changes equal to or less than 1% based on the list/net prices are considered as no price change; price changes greater than 1% are counted as a price increase or price decrease.

[6] The consumer spend for each group (Total, No Price Change, Price Increase, and Price Decrease) is the total final consumer spend of all the SKUs in the group during July 2020 – May 2022.

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 1b

Price Changes of the Top 100 Paid Apps
With A Service Fee Rate Reduction of At Least 10 Percentage Points in July 2021

July 2020 – June 2021 vs. July 2021 - May 2022

	Total	No Price Change	Price Increase	Price Decrease
Based on List Price				
Count of SKUs	100			
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average List Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% List Price Change				
Based on Net Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average Net Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% Net Price Change				

Notes:

[1] The analysis considers the top 100 paid apps ranked by total consumer spend during July 2020 to May 2022 among paid apps with non-zero sales in every month between July 2020 and May 2022 and had a service fee rate reduction of at least 10% (i.e., from 30% to 20% or less) in the month of July 2021. The service fee rate can revert back to 30% right after July 2021, which allows the sample to include SKUs that exceeded the policy's annual $1M cap ($0.5M for 2021) between July 2021 and May 2022.

[2] Service fee rates are first calculated at SKU-level for the pre-/post-period as the total gross Google service fee revenue divided by the total gross consumer spend in the period. The average service fee rate in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period service fee rates.

[3] List prices are first calculated at SKU-level in the pre-/post-period as the total gross consumer spend divided by the total quantity purchased in the period. The average list price in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period list prices.

[4] Net prices are first calculated at SKU-level in the pre-/post-period as the total gross consumer spend net of developer-offered discounts divided by the total quantity purchased in the period. The average net price in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period net prices.

[5] Price changes equal to or less than 1% based on the list/net prices are considered as no price change; price changes greater than 1% are counted as a price increase or price decrease.

[6] The consumer spend for each group (Total, No Price Change, Price Increase, and Price Decrease) is the total final consumer spend of all the SKUs in the group during July 2020 – May 2022.

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 1c

Price Changes of the Top 100 Paid Apps

July 2020 – June 2021 vs. July 2021 - May 2022

	Total	No Price Change	Price Increase	Price Decrease
Based on List Price				
Count of SKUs	100			
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average List Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% List Price Change				
Based on Net Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average Net Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% Net Price Change				

Notes:

[1] The analysis considers the top 100 paid apps ranked by total consumer spend between July 2020 and May 2022.

[2] Service fee rates are first calculated at SKU-level for the pre-/post-period as the total gross Google service fee revenue divided by the total gross consumer spend in the period. The average service fee rate in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period service fee rates.

[3] List prices are first calculated at SKU-level in the pre-/post-period as the total gross consumer spend divided by the total quantity purchased in the period. The average list price in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period list prices.

[4] Net prices are first calculated at SKU-level in the pre-/post-period as the total gross consumer spend net of developer-offered discounts divided by the total quantity purchased in the period. The average net price in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period net prices.

[5] Price changes equal to or less than 1% based on the list/net prices are considered as no price change; price changes greater than 1% are counted as a price increase or price decrease.

[6] The consumer spend for each group (Total, No Price Change, Price Increase, and Price Decrease) is the total final consumer spend of all the SKUs in the group during July 2020 – May 2022.

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 2a

Price Changes of the Top 100 IAPs
With A Flat Service Fee Rate Reduction of 15 Percentage Points After July 2021

July 2020 – June 2021 vs. July 2021 - May 2022

	Total	No Price Change	Price Increase	Price Decrease
Based on List Price				
Count of SKUs	100			
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average List Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% List Price Change				
Based on Net Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average Net Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% Net Price Change				

Notes:

[1] The analysis considers the top 100 IAPs ranked by total consumer spend during July 2020 and May 2022 among IAPs with non-zero sales in every month between July 2020 and May 2022, subject to a 30% service fee rate in every month between July 2020 and June 2021 and a 15% service fee rate in every month between July 2021 and May 2022.

[2] Service fee rates are first calculated at SKU-level for the pre-/post-period as the total gross Google service fee revenue divided by the total gross consumer spend in the period. The average service fee rate in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period service fee rates.

[3] List prices are first calculated at SKU-level in the pre-/post-period as the total gross consumer spend divided by the total quantity purchased in the period. The average list price in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period list prices.

[4] Net prices are first calculated at SKU-level in the pre-/post-period as the total gross consumer spend net of developer-offered discounts divided by the total quantity purchased in the period. The average net price in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period net prices.

[5] Price changes equal to or less than 1% based on the list/net prices are considered as no price change; price changes greater than 1% are counted as a price increase or price decrease.

[6] The consumer spend for each group (Total, No Price Change, Price Increase, and Price Decrease) is the total final consumer spend of all the SKUs in the group during July 2020 – May 2022.

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 2b

Price Changes of the Top 100 IAPs
With A Service Fee Rate Reduction of At Least 10 Percentage Points in July 2021

July 2020 – June 2021 vs. July 2021 - May 2022

	Total	No Price Change	Price Increase	Price Decrease
Based on List Price				
Count of SKUs	100			
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average List Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% List Price Change				
Based on Net Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average Net Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% Net Price Change				

Notes:

[1] The analysis considers the top 100 IAPs ranked by total consumer spend during July 2020 to May 2022 among IAPs with non-zero sales in every month between July 2020 and May 2022 and had a service fee rate reduction of at least 10% (i.e., from 30% to 20% or less) in the month of July 2021. The service fee rate can revert back to 30% right after July 2021, which allows the sample to include SKUs that exceeded the policy's annual $1M cap ($0.5M for 2021) between July 2021 and May 2022.

[2] Service fee rates are first calculated at SKU-level for the pre-/post-period as the total gross Google service fee revenue divided by the total gross consumer spend in the period. The average service fee rate in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period service fee rates.

[3] List prices are first calculated at SKU-level in the pre-/post-period as the total gross consumer spend divided by the total quantity purchased in the period. The average list price in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period list prices.

[4] Net prices are first calculated at SKU-level in the pre-/post-period as the total gross consumer spend net of developer-offered discounts divided by the total quantity purchased in the period. The average net price in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period net prices.

[5] Price changes equal to or less than 1% based on the list/net prices are considered as no price change; price changes greater than 1% are counted as a price increase or price decrease.

[6] The consumer spend for each group (Total, No Price Change, Price Increase, and Price Decrease) is the total final consumer spend of all the SKUs in the group during July 2020 – May 2022.

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 2c

Price Changes of the Top 100 IAPs

July 2020 – June 2021 vs. July 2021 - May 2022

	Total	No Price Change	Price Increase	Price Decrease
Based on List Price				
Count of SKUs	100			
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average List Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% List Price Change				
Based on Net Price				
Count of SKUs				
Consumer Spend ($)				
Consumer Spend (% of the Top 100)				
Average Service Fee Rate				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
Average Net Price				
2020.07.01 - 2021.06.30				
2021.07.01 - 2022.05.31				
% Net Price Change				

Notes:

[1] The analysis considers the top 100 IAP SKUs ranked by total consumer spend between July 2020 and May 2022.

[2] Service fee rates are first calculated at SKU-level for the pre-/post-period as the total gross Google service fee revenue divided by the total gross consumer spend in the period. The average service fee rate in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period service fee rates.

[3] List prices are first calculated at SKU-level in the pre-/post-period as the total gross consumer spend divided by the total quantity purchased in the period. The average list price in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period list prices.

[4] Net prices are first calculated at SKU-level in the pre-/post-period as the total gross consumer spend net of developer-offered discounts divided by the total quantity purchased in the period. The average net price in the pre-/post-period is then calculated as the average across the SKU-level pre-/post-period net prices.

[5] Price changes equal to or less than 1% based on the list/net prices are considered as no price change; price changes greater than 1% are counted as a price increase or price decrease.

[6] The consumer spend for each group (Total, No Price Change, Price Increase, and Price Decrease) is the total final consumer spend of all the SKUs in the group during July 2020 – May 2022.

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 3a

Comparison of New and Existing IAPs of Apps
Associated with the Top 100 IAPs with a Flat Service Fee Rate Reduction of 15 Percentage Points After July 2021

App Package Name	Comparison of New vs Existing SKUs (July 2021 - May 2022)						Comparison of New SKUs 2020 (July - Dec.) vs 2021 (July - Dec.)							
	SKU Count		Avg List Price		Avg Monthly Consumer Spend		New SKU Count		Total New SKU Consumer Spend		New SKU Consumer Spend (% of Total IAP Spend for the App)		Consumer Spend (%) per New SKU	
	Existing	New	Existing	New	Existing	New	2020	2021	2020	2021	2020	2021	2020	2021

Notes:

[1] The top 100 IAP SKUs analyzed in Exhibit 2a are associated with 72 apps, among which only 25 had new SKUs since July 2021

[2] The average list prices and consumer spend are calculated based on data from July 2021 to May 2022   For each app, the average list price of existing (new) SKUs is calculated as the average across the post-July 2021 average prices of each existing (new) SKU of the app; the average monthly consumer spend of existing (new) SKUs is calculated the average across the post-July 2021 monthly average final consumer spend of each existing (new) SKUs of the app

[3] "Existing" SKUs are SKUs which had their first sales anytime before July 2021 (including before July 2020), and had non-zero sales during both July 2020 – June 2021 and July 2021 – May 2022

[4] "New" SKUs are SKUs which had their first sales during the time period indicated by the panel title and column year (i e , July 2021 - May 2022, July - December 2020, or July - December 2021 respectively)

[5] "Consumer Spend (%) per new SKU" shows the average percentage of final consumer spend accounted for by one new SKU, i e , "New SKU Consumer Spend (%)" divided by the number of new SKUs

[6] Some apps launched new SKUs in the period of July 2021 - May 2022 but outside the time window of the right panel analysis (July 2021 – December 2021), thus are shown as having no new SKU in 2021 in the right panel

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260

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Exhibit 3b

Comparison of New and Existing IAPs of Apps
Associated with the Top 100 IAPs with a Service Fee Rate Reduction of At Least 10 Percentage Points in July 2021

App Package Name	Comparison of New vs Existing SKUs (July 2021 - May 2022)						Comparison of New SKUs 2020 (July - Dec.) vs 2021 (July - Dec.)							
	SKU Count		Avg List Price		Avg Monthly Consumer Spend		New SKU Count		Total New SKU Consumer Spend		New SKU Consumer Spend (% of Total IAP Spend for the App)		Consumer Spend (%) per New SKU	
	Existing	New	Existing	New	Existing	New	2020	2021	2020	2021	2020	2021	2020	2021

Notes:

[1] The top 100 IAP SKUs analyzed in Exhibit 2b are associated with 57 apps, among which only 28 had new SKUs since July 2021

[2] The average list prices and consumer spend are calculated based on data from July 2021 to May 2022 For each app, the average list price of existing (new) SKUs is calculated as the average across the post-July 2021 average prices of each existing (new) SKU of the app; the average monthly consumer spend of existing (new) SKUs is calculated the average across the post-July 2021 monthly average final consumer spend of each existing (new) SKUs of the app

[3] "Existing" SKUs are SKUs which had their first sales anytime before July 2021 (including before July 2020), and had non-zero sales during both July 2020 – June 2021 and July 2021 – May 2022

[4] "New" SKUs are SKUs which had their first sales during the time period indicated by the panel title and column year (i e , July 2021 - May 2022, July - December 2020, or July - December 2021 respectively)

[5] "Consumer Spend (%) per new SKU" shows the average percentage of final consumer spend accounted for by one new SKU, i e , "New SKU Consumer Spend (%)" divided by the number of new SKUs

[6] Some apps launched new SKUs in the period of July 2021 - May 2022 but outside the time window of the right panel analysis (July 2021 – December 2021), thus are shown as having no new SKU in 2021 in the right panel

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260

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Exhibit 3c

Comparison of New and Existing IAPs of Apps Associated with the Top 100 IAPs

App Package Name	Comparison of New vs Existing SKUs (July 2021 - May 2022)						Comparison of New SKUs 2020 (July - Dec.) vs 2021 (July - Dec.)							
	SKU Count		Avg List Price		Avg Monthly Consumer Spend		New SKU Count		Total New SKU Consumer Spend		New SKU Consumer Spend (% of Total IAP Spend for the App)		Consumer Spend (%) per New SKU	
	Existing	New	Existing	New	Existing	New	2020	2021	2020	2021	2020	2021	2020	2021

Notes:

[1] The top 100 IAP SKUs analyzed in Exhibit 2c are associated with 40 apps, among which only 31 had new SKUs since July 2021

[2] The average list prices and consumer spend are calculated based on data from July 2021 to May 2022 For each app, the average list price of existing (new) SKUs is calculated as the average across the post-July 2021 average prices of each existing (new) SKU of the app; the average monthly consumer spend of existing (new) SKUs is calculated the average across the post-July 2021 monthly average final consumer spend of each existing (new) SKUs of the app

[3] "Existing" SKUs are SKUs which had their first sales anytime before July 2021 (including before July 2020), and had non-zero sales during both July 2020 – June 2021 and July 2021 – May 2022

[4] "New" SKUs are SKUs which had their first sales during the time period indicated by the panel title and column year (i e , July 2021 - May 2022, July - December 2020, or July - December 2021 respectively)

[5] "Consumer Spend (%) per new SKU" shows the average percentage of final consumer spend accounted for by one new SKU, i e , "New SKU Consumer Spend (%)" divided by the number of new SKUs

[6] Some apps launched new SKUs in the period of July 2021 - May 2022 but outside the time window of the right panel analysis (July 2021 – December 2021), thus are shown as having no new SKU in 2021 in the right panel

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260

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Exhibit 4a

Price Changes of Tinder Subscription SKUs

July 2020 – June 2021 vs. July 2021 – Dec. 2021 vs. Jan. 2022 – May 2022

	Total	July 2020 - June 2021 v. July 2021 - Dec. 2021			July 2021 - Dec. 2021 v. Jan. 2022 - May 2022		
		No Price Change	Price Increase	Price Decrease	No Price Change	Price Increase	Price Decrease
Based on List Price							
Count of SKUs							
Consumer Spend ($)							
Consumer Spend (%)							
Average Service Fee Rate							
2020.07 - 2021.06 (Period 1							
2021.07 - 2021.12 (Period 2							
2022.01 - 2022.05 (Period 3							
Average List Price							
2020.07 - 2021.06 (Period 1							
2021.07 - 2021.12 (Period 2							
2022.01 - 2022.05 (Period 3							
% List Price Change							
Period 1 v. Period 2							
Period 2 v. Period 3							
Based on Net Price							
Count of SKUs							
Consumer Spend ($)							
Consumer Spend (%)							
Average Service Fee Rate							
2020.07 - 2021.06 (Period 1							
2021.07 - 2021.12 (Period 2							
2022.01 - 2022.05 (Period 3							
Average Net Price							
2020.07 - 2021.06 (Period 1							
2021.07 - 2021.12 (Period 2							
2022.01 - 2022.05 (Period 3							
% Net Price Change							
Period 1 v. Period 2							
Period 2 v. Period 3							

Notes:

[1] The analysis considers Tinder subscription SKUs with non-zero sales during July 2020 – June 2021, July 2021 – December 2021, and January 2022 – May 2022.

[2] Service fee rates are first calculated at SKU-level for each of the three periods as the total gross Google service fee revenue divided by the total gross consumer spend in the period. The average service fee rate in each of the three periods is then calculated as the across the SKU-level service fee rates in the period.

[3] List prices are first calculated at SKU-level in each of the three periods as the total gross consumer spend divided by the total quantity purchased in the period. The average list price in each of the three periods is then calculated as the average across the SKU-level list prices in the period.

[4] Net prices are first calculated at SKU-level in each of the three periods as the total gross consumer spend net of developer-offered discounts divided by the total quantity purchased in the period. The average net price in each of the three periods is then calculated as the average across the SKU-level net prices in the period.

[5] Price changes equal to or less than 1% based on the list/net prices are considered as no price change; price changes greater than 1% are counted as a price increase or price decrease.

[6] The consumer spend for each group (Total, No Price Change, Price Increase, and Price Decrease) is the total final consumer spend of all the SKUs in the group during July 2020 – May 2022.

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 4b

Price Changes of Tinder Subscription SKUs Based on Originating Orders

July 2020 – June 2021 vs. July 2021 – Dec. 2021 vs. Jan. 2022 – May 2022

	Total	July 2020 - June 2021 v. July 2021 - Dec. 2021			July 2021 - Dec. 2021 v. Jan. 2022 - May 2022		
		No Price Change	Price Increase	Price Decrease	No Price Change	Price Increase	Price Decrease
Based on List Price							
Count of SKUs							
Consumer Spend ($)							
Consumer Spend (%)							
Average Service Fee Rate							
2020.07 - 2021.06 (Period 1)							
2021.07 - 2021.12 (Period 2)							
2022.01 - 2022.05 (Period 3)							
Average List Price							
2020.07 - 2021.06 (Period 1)							
2021.07 - 2021.12 (Period 2)							
2022.01 - 2022.05 (Period 3)							
% List Price Change							
Period 1 v. Period 2							
Period 2 v. Period 3							
Based on Net Price							
Count of SKUs							
Consumer Spend ($)							
Consumer Spend (%)							
Average Service Fee Rate							
2020.07 - 2021.06 (Period 1)							
2021.07 - 2021.12 (Period 2)							
2022.01 - 2022.05 (Period 3)							
Average Net Price							
2020.07 - 2021.06 (Period 1)							
2021.07 - 2021.12 (Period 2)							
2022.01 - 2022.05 (Period 3)							
% Net Price Change							
Period 1 v. Period 2							
Period 2 v. Period 3							

Notes:

[1] The analysis considers Tinder subscription SKUs with non-zero originating order sales during July 2020 – June 2021, July 2021 – December 2021, and January 2022 – May 2022.

[2] Service fee rates are first calculated at SKU-level using originating orders for each of the three periods as the total gross Google service fee revenue divided by the total gross consumer spend in the period. The average service fee rate in each of the three periods is then calculated as the across the SKU-level service fee rates in the period.

[3] List prices are first calculated at SKU-level using originating orders in each of the three periods as the total gross consumer spend divided by the total quantity purchased in the period. The average list price in each of the three periods is then calculated as the average across the SKU-level list prices in the period.

[4] Net prices are first calculated at SKU-level using originating orders in each of the three periods as the total gross consumer spend net of developer-offered discounts divided by the total quantity purchased in the period. The average net price in each of the three periods is then calculated as the average across the SKU-level net prices in the period.

[5] Price changes equal to or less than 1% based on the list/net prices are considered as no price change; price changes greater than 1% are counted as a price increase or price decrease.

[6] The consumer spend for each group (Total, No Price Change, Price Increase, and Price Decrease) is the total originating order final consumer spend of all the SKUs in the group during July 2020 – May 2022.

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 5

Estimates of Pass-Through Rate Using Synthetic Control Estimation

Time Period: July 2020 - May 2022

Main Sample

	IAPs	Paid Downloads	Subscriptions
Pass-Through Rate			
Pass-Through Rate (Upper Bound)			
P-Value			
Number of Treated SKUs			
Number of Control SKUs			
Number of SKU-Month Obs.			
Total Consumer Spend (8/16/16-5/31/22)			
Weighted Average Pass-Through Rate			

Notes:

[1] The sample includes the treated SKUs subject to a 29.5%-30.5% service fee rate in the pre period (from July 2020 to June 2021) and 14.5%-15.5% in the post period (from July 2021 to May 2022), and the control SKUs subject to a 29.5%-30.5% service fee rate throughout July 2020 and May 2022.

[2] The sample is "balanced" by restricting to include only SKUs with non-zero sales in every month betweeen July 2020 and May 2022.

[3] A confidence interval with 95% confidence is constructed for the pass-through rate. The reported upper bound is the right end of this confidence interval.

[4] A low p-value (<= 0.05) indicates that the regression estimate is statistically significant, i.e., one can reject the null hypothesis that the regression estimate is zero; a high p-value (> 0.05) indicates that the regression estimate is not statistically significant, i.e., one cannot reject the null hypothesis that the regression estimate is zero.

[5] The weighted average pass-through rate is the upper bound of pass-through rates for IAPs, paid downloads, and subscriptions, weighted by the total class period consumer spend net of discounts for each.

Source:

[1] Google Play transaction data; GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 6

Price Comparison of Top Paid Game Apps in ONE Store vs Google Play Store

App Prices in South Korea as of October 29th, 2022 (in South Korean Won)

App Name	App Price	
	ONE Store	Google Play
The Cloud Dream of the Nine M	33,000 Won	33,000 Won
Dead Cells	21,000 Won	12,000 Won / In App Purchase
Some Some Store: Love Convenience Store	15,000 Won	15,000 Won
Miracle snack shop	14,000 Won	14,000 Won
Wonder Boy: The Dragon's Trap	10,000 Won	12,000 Won
Dawn of Flower	15,000 Won	In App Purchase
When you wish upon a star	7,000 Won	7,000 Won
Knight Run: Homecoming	11,000 Won	11,000 Won
Love Flute	10,000 Won	10,000 Won
White day: A labyrinth named school	8,800 Won	8,900 Won
Lu Bu Maker	8,000 Won	8,000 Won
DragonSpear-EX	5,900 Won	5,900 Won
She is Mermaid	5,000 Won	5,000 Won
Some Some Convenience Store / Soohee After Story	5,000 Won	5,000 Won
Istelia Story	2,300 Won	2,300 Won
Persephone	4,000 Won	6,500 Won
Shin Hayarigami - Blind man	3,300 Won	3,300 Won
Inbento	3,000 Won	2,300 Won
Cut the Rope: Time Travel	3,000 Won	Free / In App Purchase
Sweatshop Diary DX	3,000 Won	Free / In App Purchase
Memorize Season 4	3,000 Won	3,000 Won
My future girlfriend greeted me	3,000 Won	3,000 Won
Dungeon Warfare	2,900 Won	3,300 Won
The Pleiades of Dreaming Starlight	2,900 Won	2,900 Won
Shin Hayarigami - Doll	2,200 Won	2,200 Won
Decalcomanie	2,000 Won	2,500 Won
Go Stop Puzzle2	1,999 Won	Free / In App Purchase
Dead End 99	1,900 Won	1,900 Won
Hero Rescue Girl: Pin Puzzle	1,000 Won	Free

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Exhibit 6

Price Comparison of Top Paid Game Apps in ONE Store vs Google Play Store

App Prices in South Korea as of October 29th, 2022 (in South Korean Won)

App Name	App Price	
	ONE Store	**Google Play**
Cobra Strike	1,000 Won	999 Won
Naval Warfare Korea vs Japan	1,000 Won	1,000 Won
Until She Sings Again	4,500 Won	N/A
Mole Hunter Master	100 Won	N/A
Dice Merge	100 Won	N/A
Flying Airplane	100 Won	N/A
Fishing Master PLUS	5,000 Won	N/A
2048 Classic	100 Won	N/A
Teddy Bear Forest	200 Won	N/A
Colorless Run Pro	100 Won	N/A
The Art of War - the 36th Stratagems	1,999 Won	N/A
Memory Game	100 Won	N/A
Making a Younger Sister: Part 3	1,000 Won	N/A
SPEDOG	100 Won	N/A
All Random Zombie Defense	200 Won	N/A
Eagle Strike	200 Won	N/A
Air Hockey	100 Won	N/A
Summer in the Forest - Healing Game	500 Won	N/A
Frog Jump	500 Won	N/A
Building Blocks	100 Won	N/A
Block Magic Puzzle	100 Won	N/A

Notes:

[1]   The table includes top paid apps based on paid sales in ONE Store in South Korea, as of October 29, 2022.

Sources:

[1]   https://www.mobileindex.com/mi-chart/daily-rank

[2]   App prices for each app are obtained from the ONE Store and Google Play websites as of October 30, 2022.

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Exhibit 7a

**Percentage Change in Consumer Class Damages based on Dr. Singer's
Damages Models with Empirical Pass-Through Estimate** ▮

	Singer App/In-App Model	Singer Combined Market Take Rate Model

0%
-20%
-40%
-60%
-80%
-100%
-120%

Sources: Exhibits 8a, 8b, and 8d.
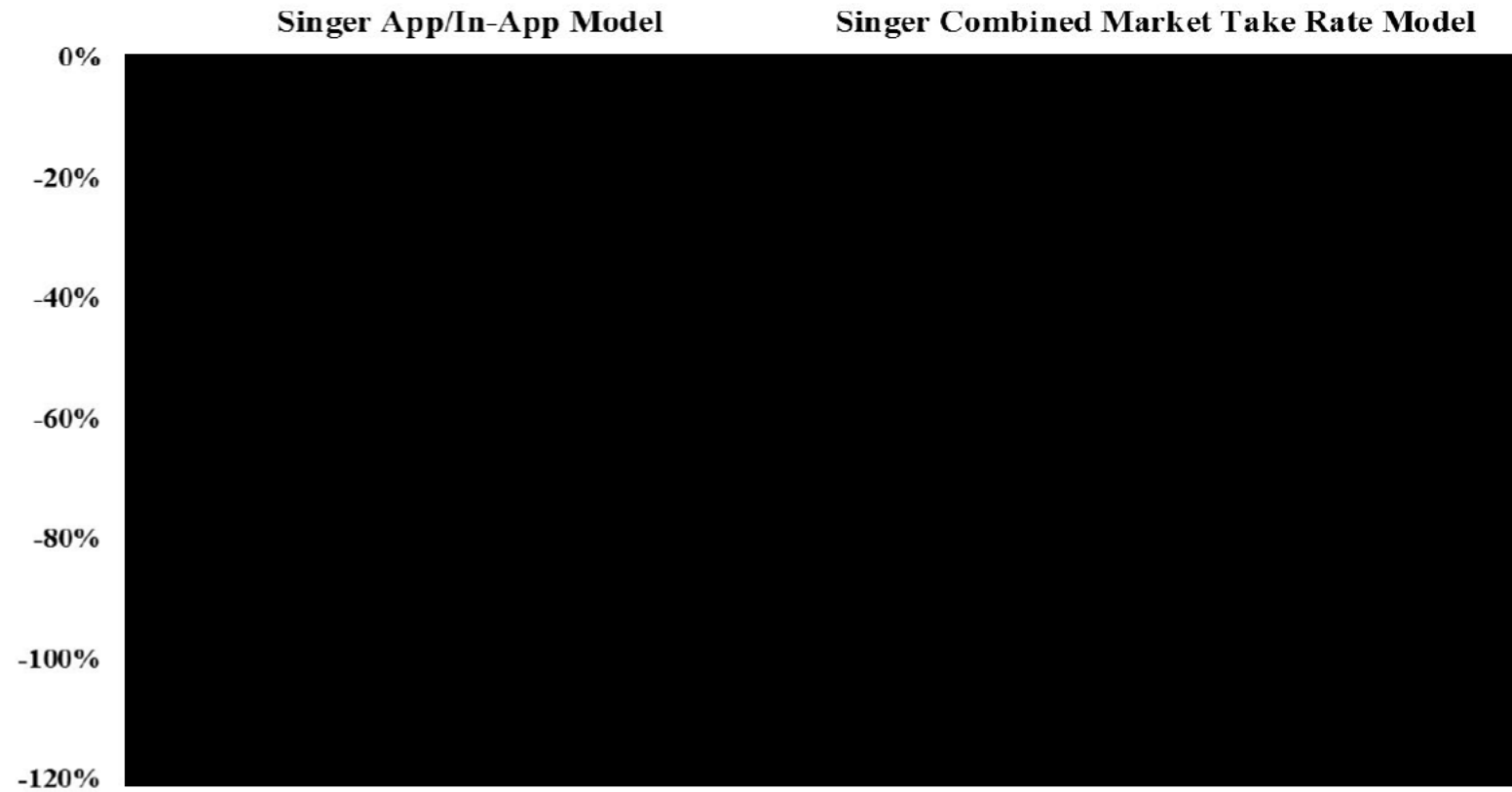
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Exhibit 7b

**Percentage Change in Consumer Class Damages based on Dr. Singer's
Combined Market Take Rate Model with Alternative Google Play Market Shares**

But-for Market Share

| 60% | 65% | 70% | 75% | 80% | 85% | 90% | 95% | 97% | | 60% | 65% | 70% | 75% | 80% | 85% |

Source: Exhibit 8d.

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Exhibit 7c

Percentage Change in Consumer Class Damages based on Dr. Singer's Damages Models with A Linear Demand Curve

Singer App/In-App Model   Singer Combined Market Take Rate Model

Sources: Exhibits 8a, 8b, and 8d.
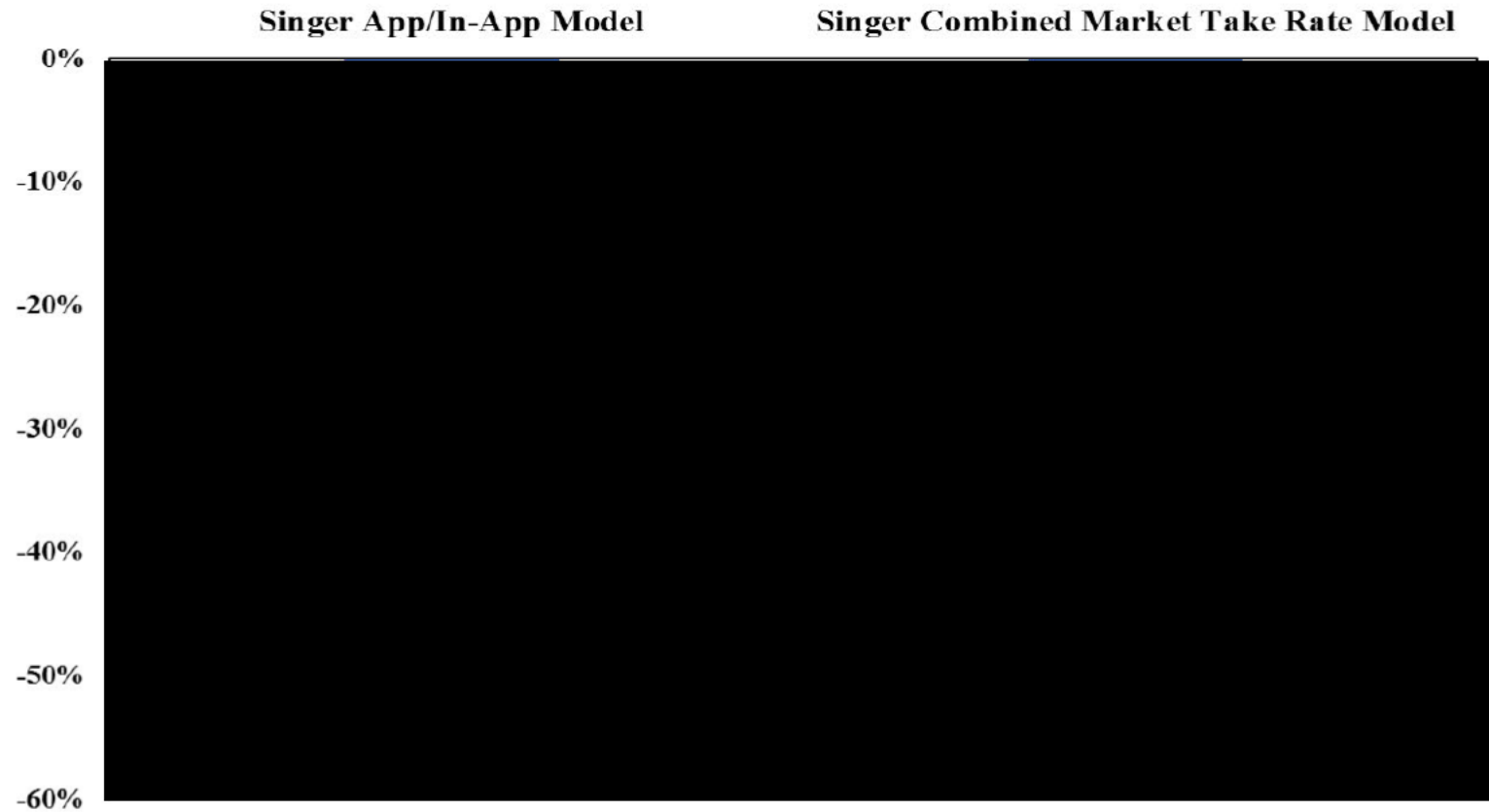
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Exhibit 7d

Percentage Change in Consumer Class Damages based on Dr. Singer's IAP Model with Alternative Competitor Supply Elasticities

But-for Competitor Supply Elasticity = 2   **But-for Competitor Supply Elasticity = 0**

Source: Exhibit 8b.

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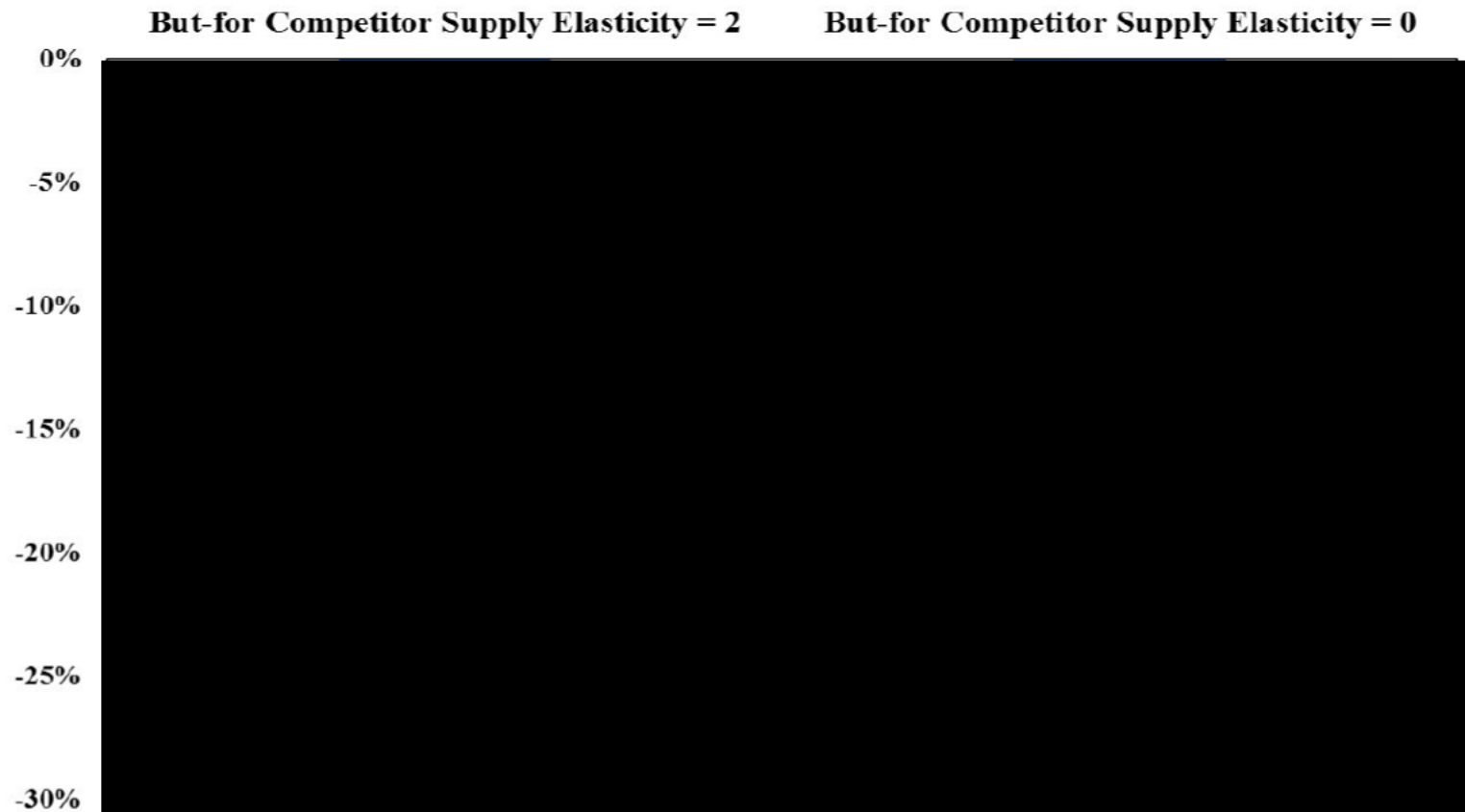
Exhibit 7e

But-For Take Rates based on Dr. Singer's Class Report and Merits Report
Combined Market Take Rate Model with Empirical Pass-Through Rate Estimate
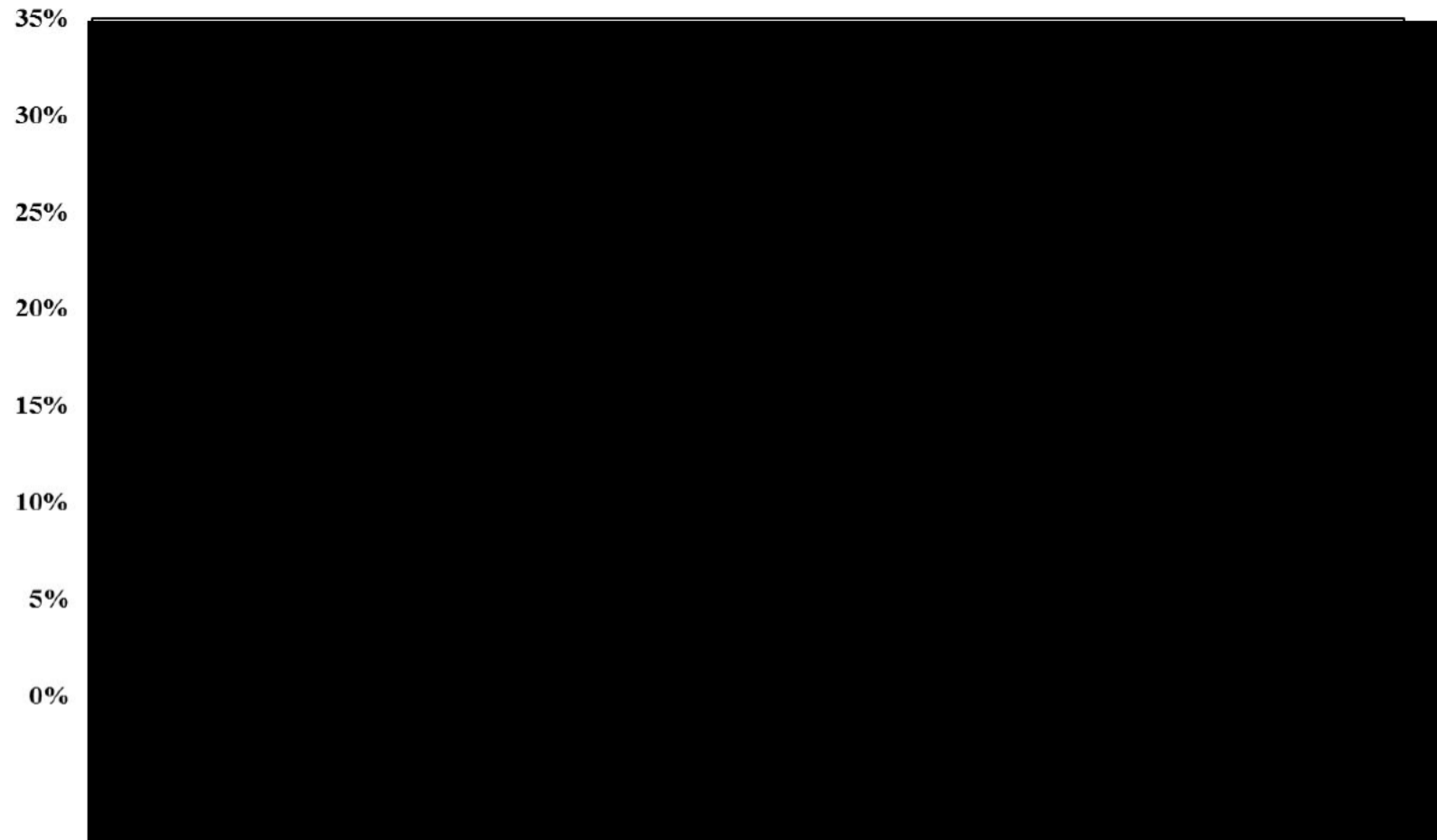
Source: Singer Report Production.

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Exhibit 7f

Consumer Class Damages based on Dr. Singer's Combined Market Take Rate Model

Source: Exhibit 8d.

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Exhibit 8a

Consumer Class Damages based on Dr. Singer's App Distribution Market Model

August 16, 2016 - May 31, 2022

	Model Input				Calculation Output			
Pass-Through Rate	Google Play Actual Market Share	Google Play But-for Market Share	Actual Take Rate	Actual Consumer Subsidy as a Percent of Gross Consumer Spend	But-for Take Rate	But-for Consumer Subsidy as a Percent of Gross Consumer Spend	% Change from Dr. Singer's Damages Estimate	Consumer Class Damages based on Dr. Singer's Model ($M)

Notes:

[1] The ▮ pass-through rate is based on my empirical estimation. See Exhibit 5.

[2] I replace Dr. Singer's original model inputs with those highlighted in blue and keep the other ones unchanged.

Source:

[1] Singer Report Production.

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Exhibit 8b

Consumer Class Damages based on Dr. Singer's IAP Model

August 16, 2016 - May 31, 2022

	Model Input				Calculation Output		
Pass-Through Rate	Google Play Actual Market Share	Google Play But-for Market Share	But-for Competitor Suply Elasticity	Actual Take Rate	But-for Take Rate	% Change from Dr. Singer's Damages Estimate	Consumer Class Damages based on Dr. Singer's

Notes:

[1] The ▓ pass-through rate is based on my empirical estimation See Exhibit 5

[2] I replace Dr Singer's original model inputs with those highlighted in blue and keep the other ones unchanged

Source:

[1] Singer Report Production

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Exhibit 8c

Consumer Class Damages based on Dr. Singer's Combined Market Discount Model

August 16, 2016 - May 31, 2022

Model Input					Calculation Output			
Pass-Through Rate	Google Play Actual Market Share	Google Play But-for Market Share	Actual Take Rate	Actual Consumer Subsidy as a Percent of Gross Consumer Spend	But-for Take Rate	But-for Consumer Subsidy as a Percent of Gross Consumer Spend	% Change from Dr. Singer's Damages Estimate	Consumer Class Damages based on Dr. Singer's Model ($M)

Notes:

[1] I replace Dr. Singer's original model inputs with those highlighted in blue and keep the other ones unchanged.

Source:

[1] Singer Report Production.

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Exhibit 8d

Consumer Class Damages based on Dr. Singer's Combined Market Take Rate Model

August 16, 2016 - May 31, 2022

	Model Input					Calculation Output			
Pass-Through Rate	Google Play Actual Market Share	Google Play But-for Market Share	Actual Take Rate	Actual Consumer Subsidy as a Percent of Gross Consumer Spend	But-for Take Rate	But-for Consumer Subsidy as a Percent of Gross Consumer Spend	% Change from Dr. Singer's Damages Estimate	Consumer Class Damages based on Dr. Singer's Model ($M)	

Singer Model Original

Notes:

[1] The ▮ pass-through rate is based on my empirical estimation. See Exhibit 5.

[2] I replace Dr. Singer's original model inputs with those highlighted in blue and keep the other ones unchanged.

Source:

[1] Singer Report Production.

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Exhibit 8e

Consumer Class Damages based on Dr. Singer's Combined Market Hybrid Model

August 16, 2016 - May 31, 2022

	Model Input				Calculation Output			
Pass-Through Rate	Google Play Actual Market Share	Google Play But-for Market Share	Actual Take Rate	Actual Consumer Subsidy as a Percent of Gross Consumer Spend	But-for Take Rate	But-for Consumer Subsidy as a Percent of Gross Consumer Spend	% Change from Dr. Singer's Damages Estimate	Consumer Class Damages based on Dr. Singer's Model ($M)

Singer Model Original

Notes:

[1] The ■■ pass-through rate is based on my empirical estimation See Exhibit 5

[2] I replace Dr Singer's original model inputs with those highlighted in blue and keep the other ones unchanged

Source:

[1] Singer Report Production

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Exhibit 9a

Prices of Paid Downloads Transacted in May 2022 – Games
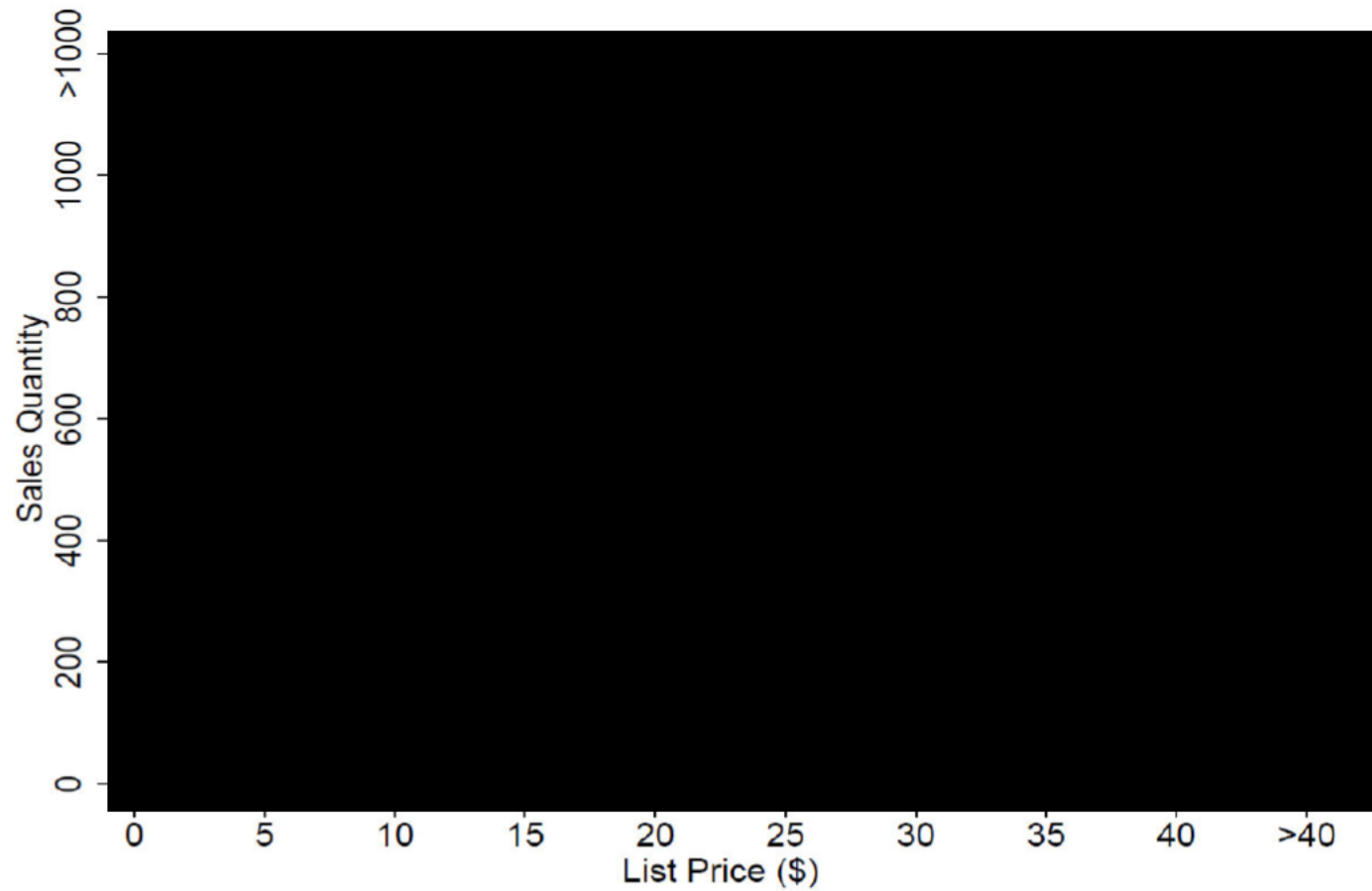
Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 9b

Prices of Paid Downloads Transacted in May 2022 - Non-Games
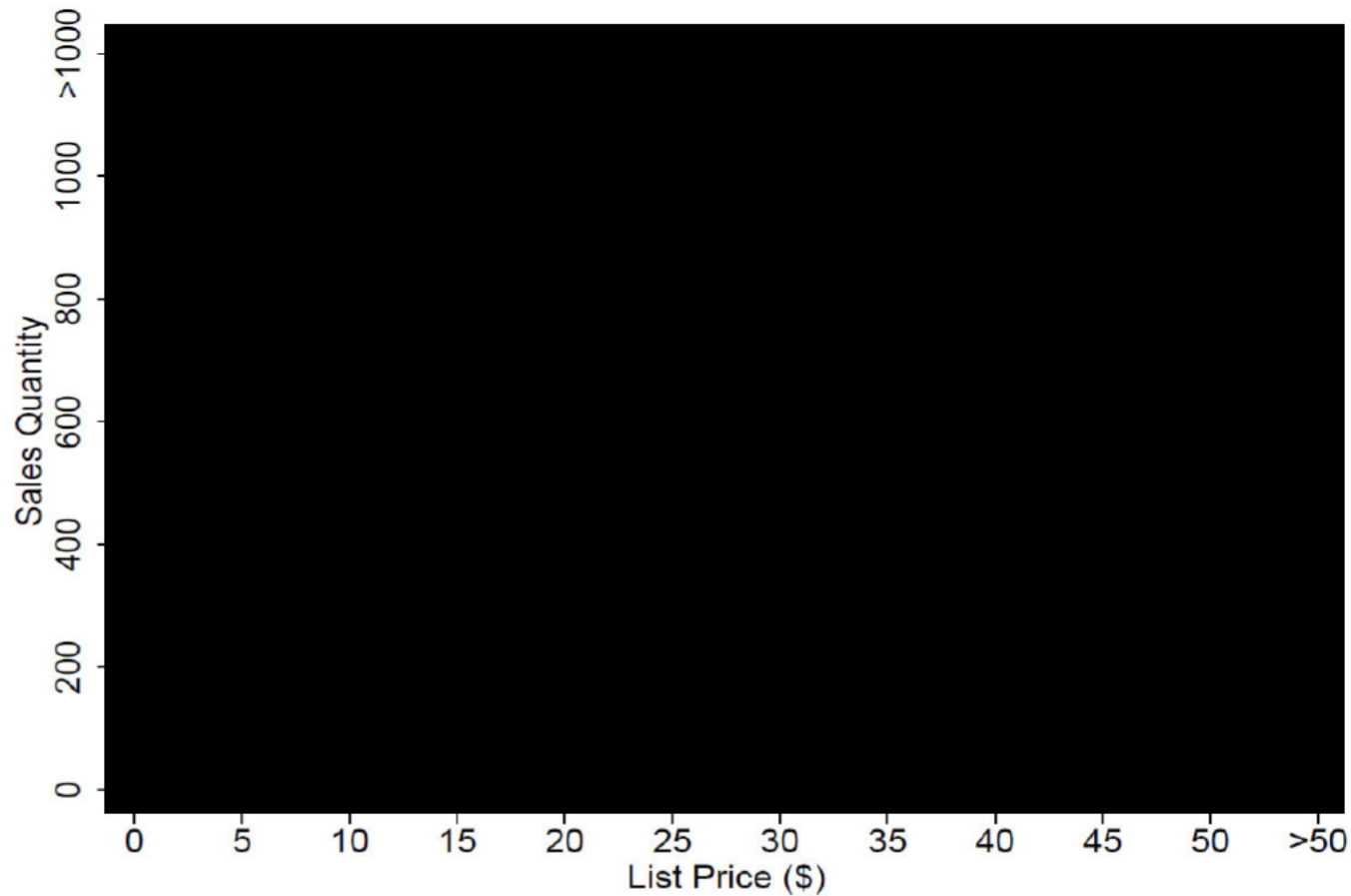
Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 10a

Prices of IAPs and Subscriptions Transacted in May 2022 - Games
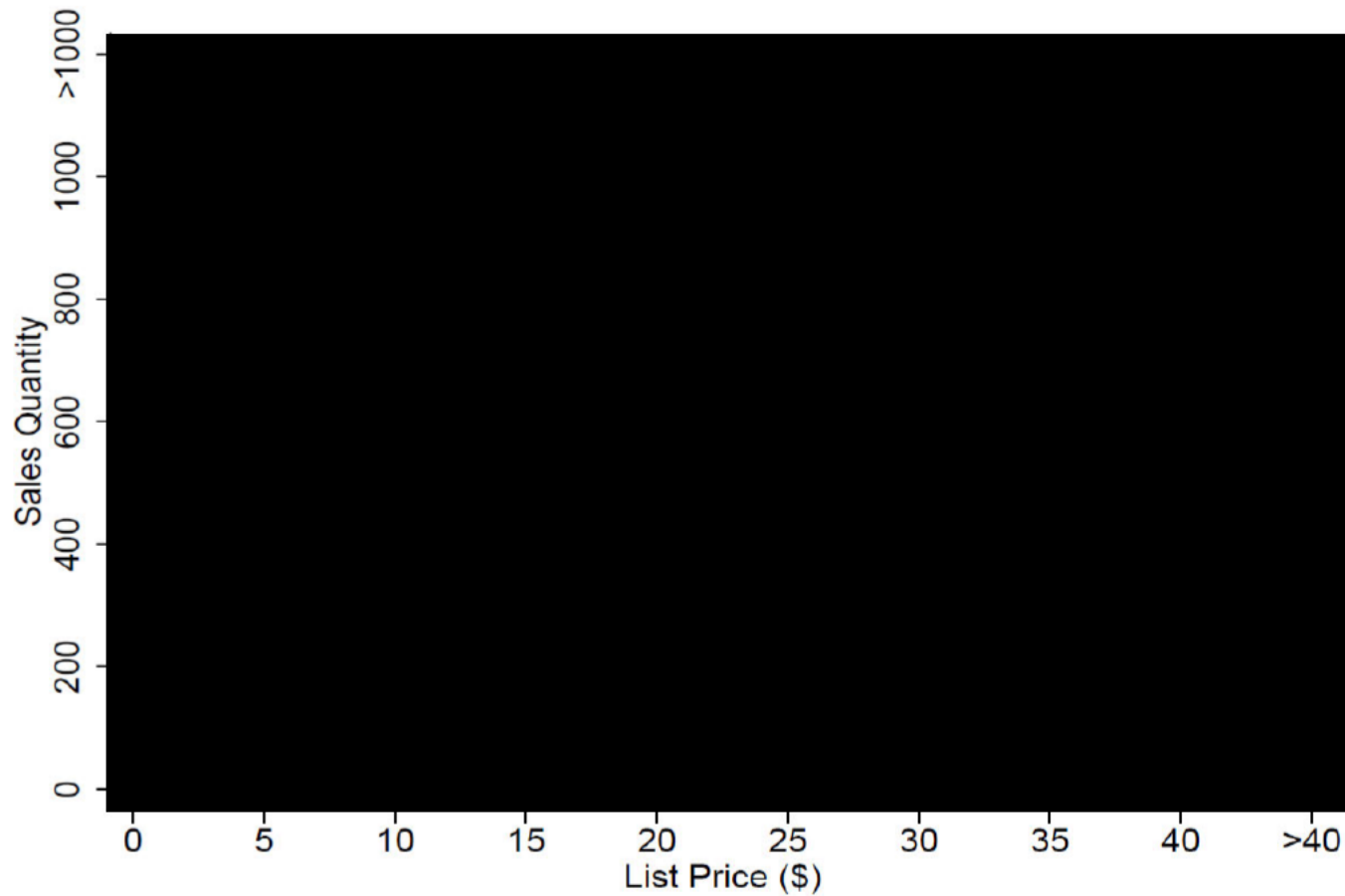
Source:
[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 10b

Prices of IAPs and Subscriptions Transacted in May 2022 - Non-Games
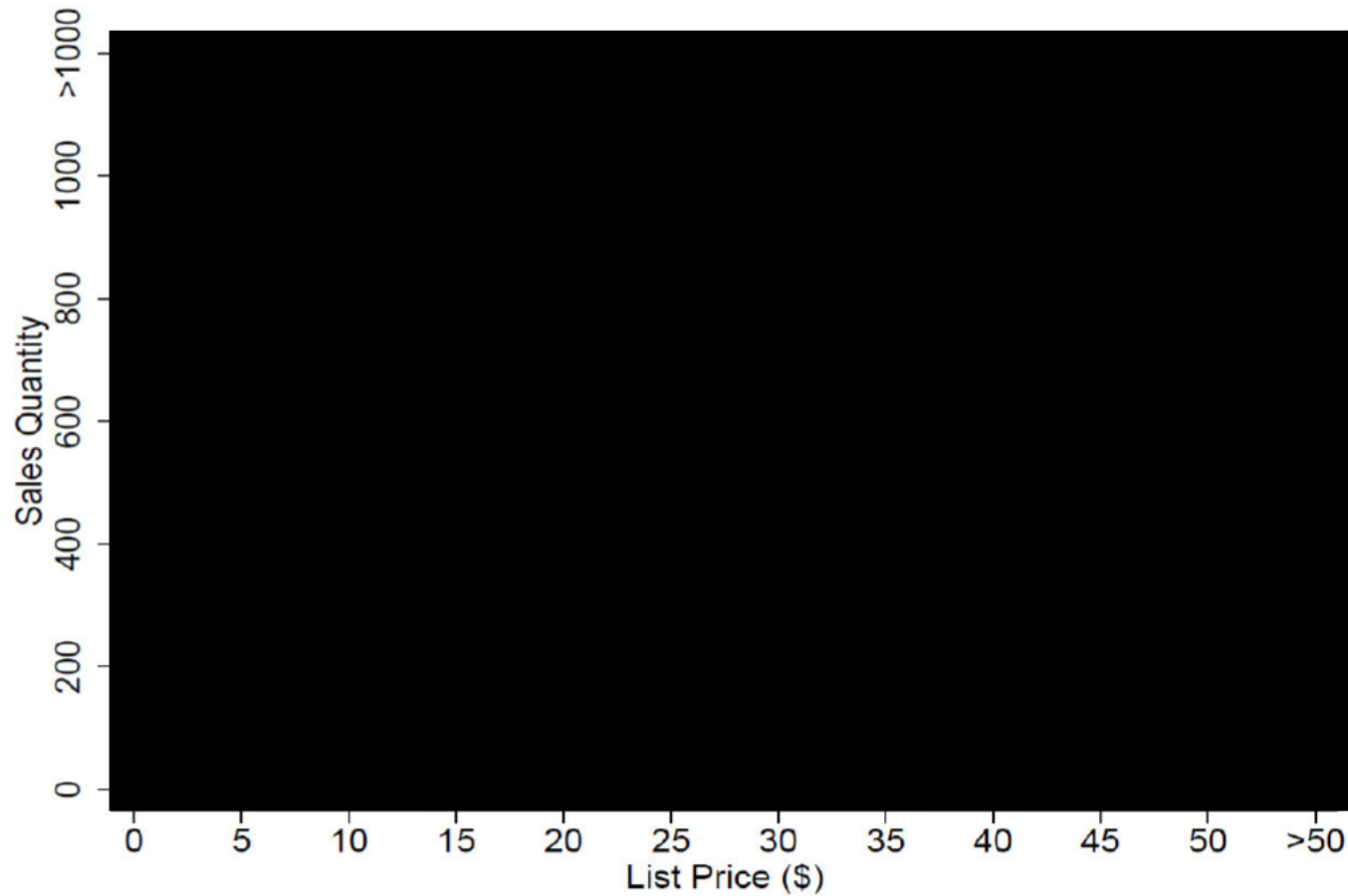
Source:
[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 11a

Quantity Sales of Paid Apps Transacted in May 2022 - Games
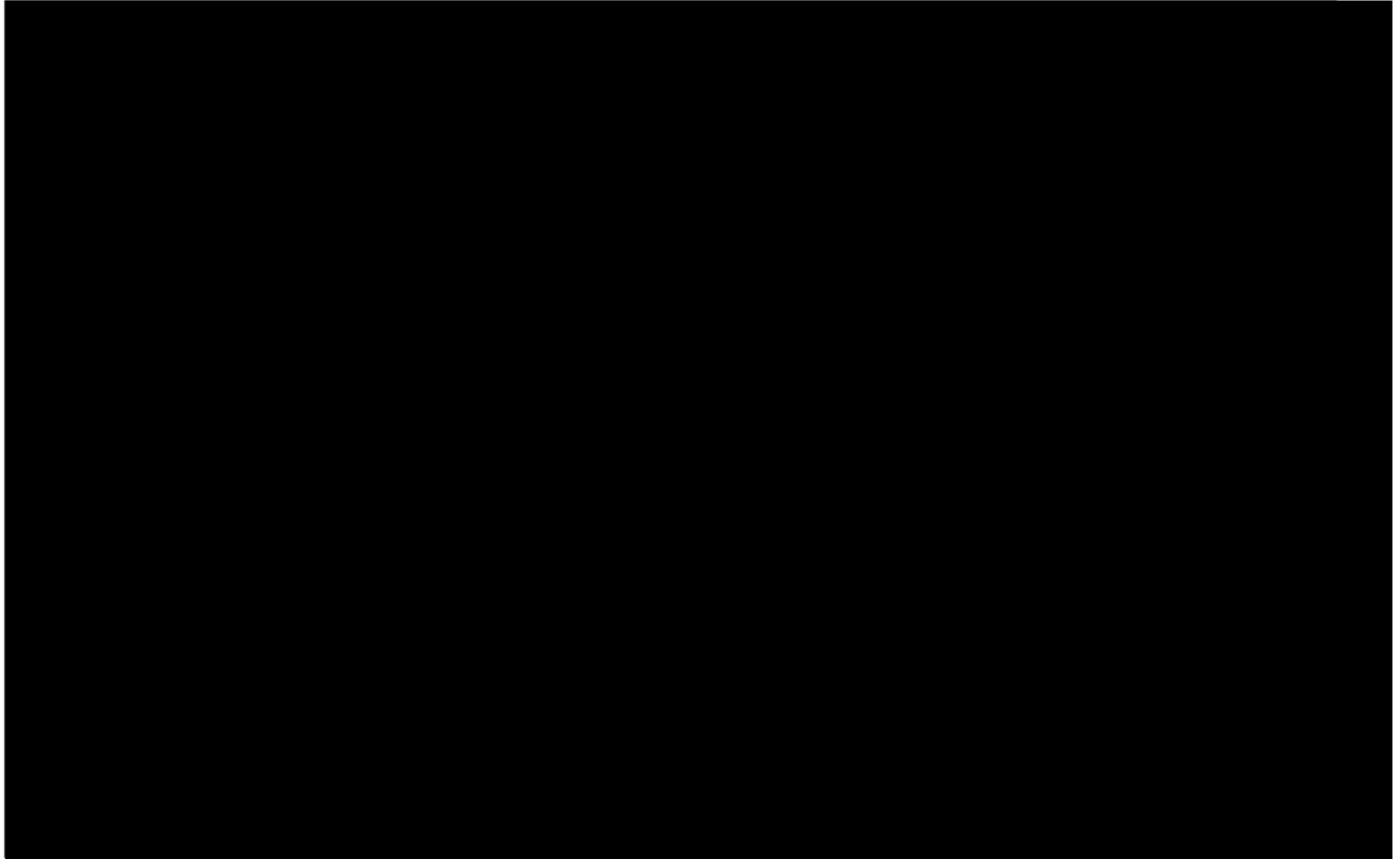
Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 11b

Quantity Sales of Paid Apps Transacted in May 2022 - Non-Games
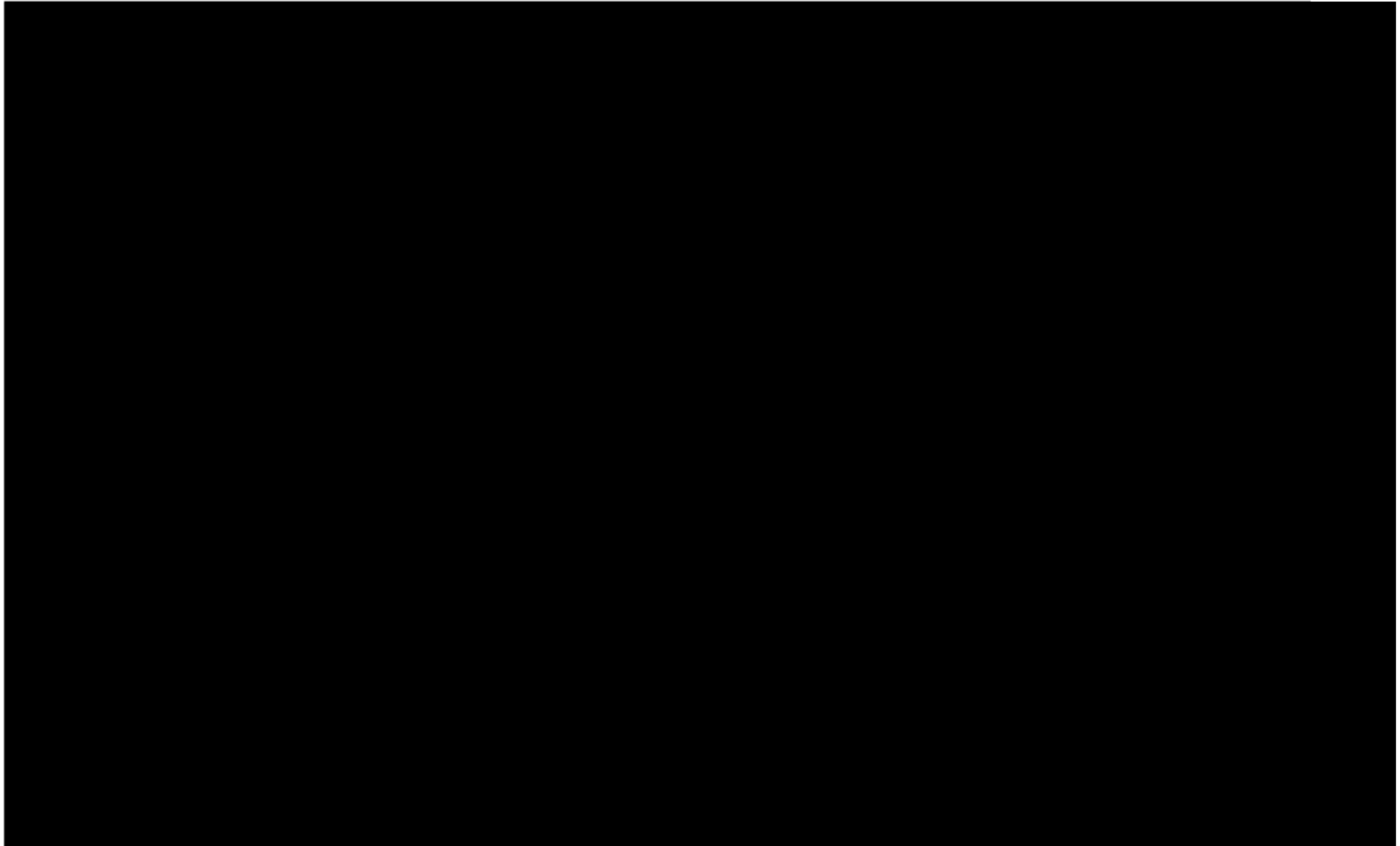
Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 12

Monthly Hours Spent on Apps
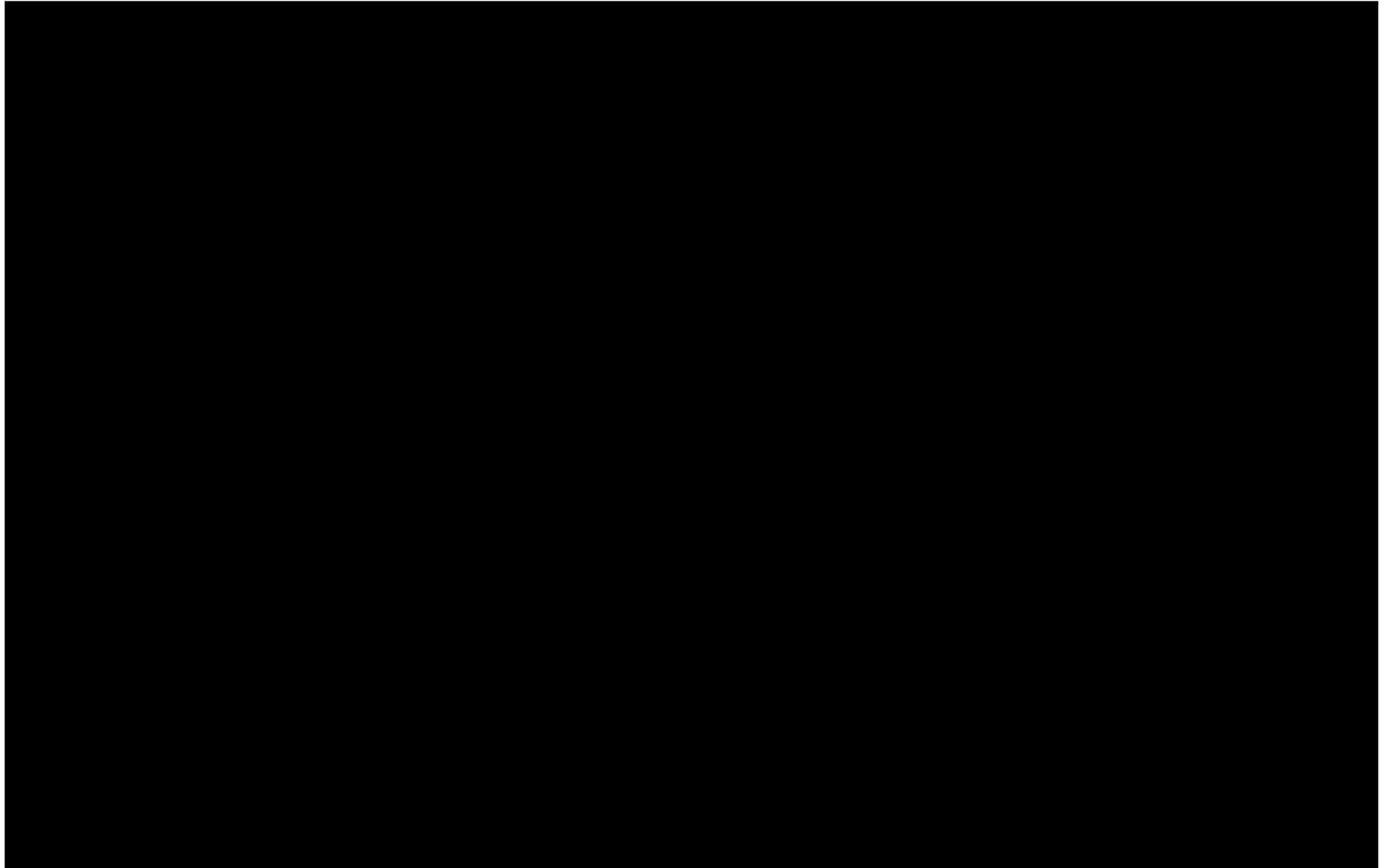
Source:

[1] App Annie data produced in response to Consumers' June 2, 2021 subpoena.

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Exhibit 13

Total Hours Spent on Selected Apps in September 2021
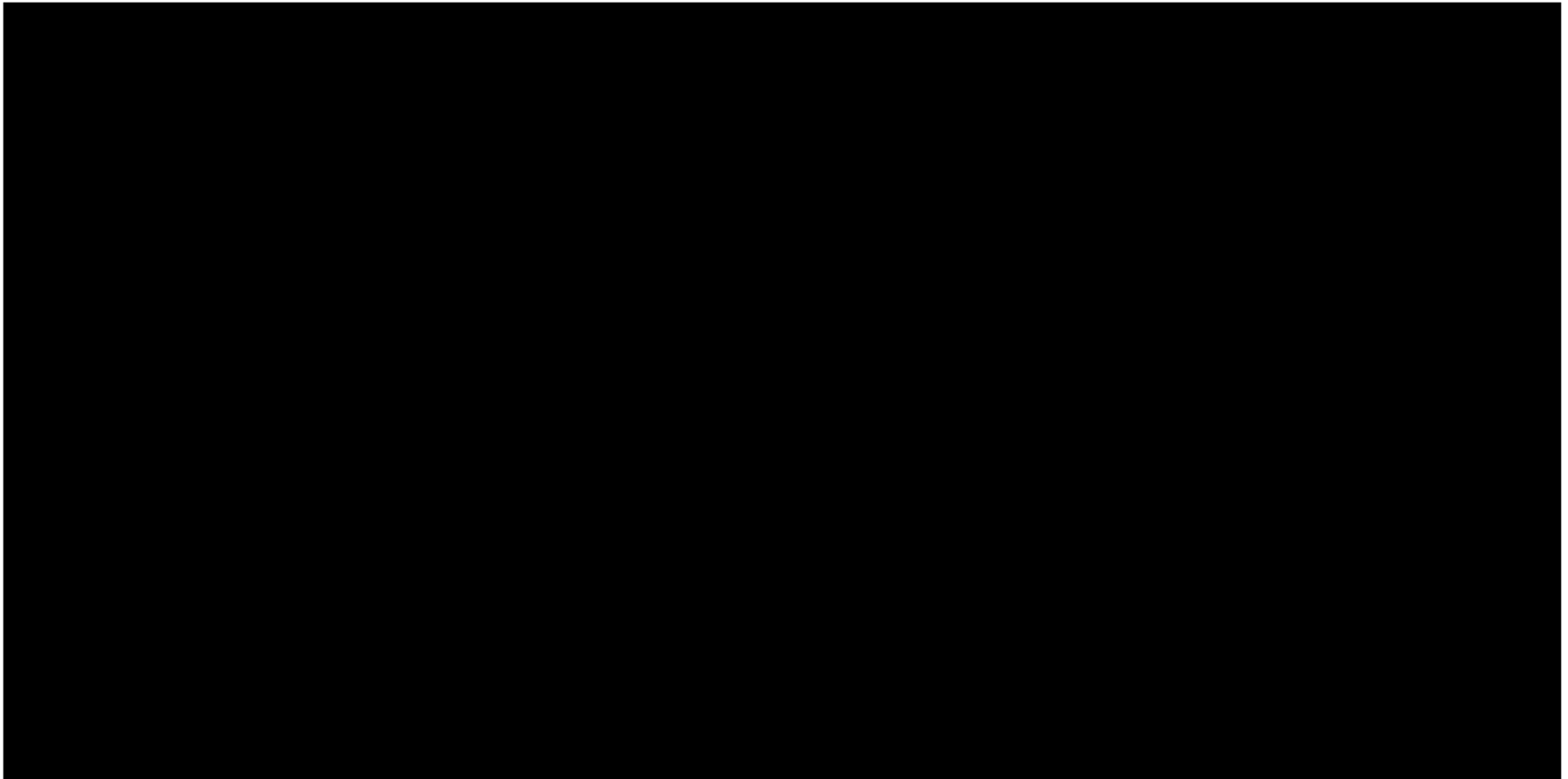
Note:
[1] The total hours spent are based on the total user usage hours for each app in September 2021.

Source:
[1] App Annie data produced in response to Consumers' June 2, 2021 subpoena.

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Exhibit 14

**Share of Consumer Spend from the Samsung Galaxy Store
of Total Consumer Spend from Google Play and Samsung Galaxy Store
on Samsung Devices in the U.S.**
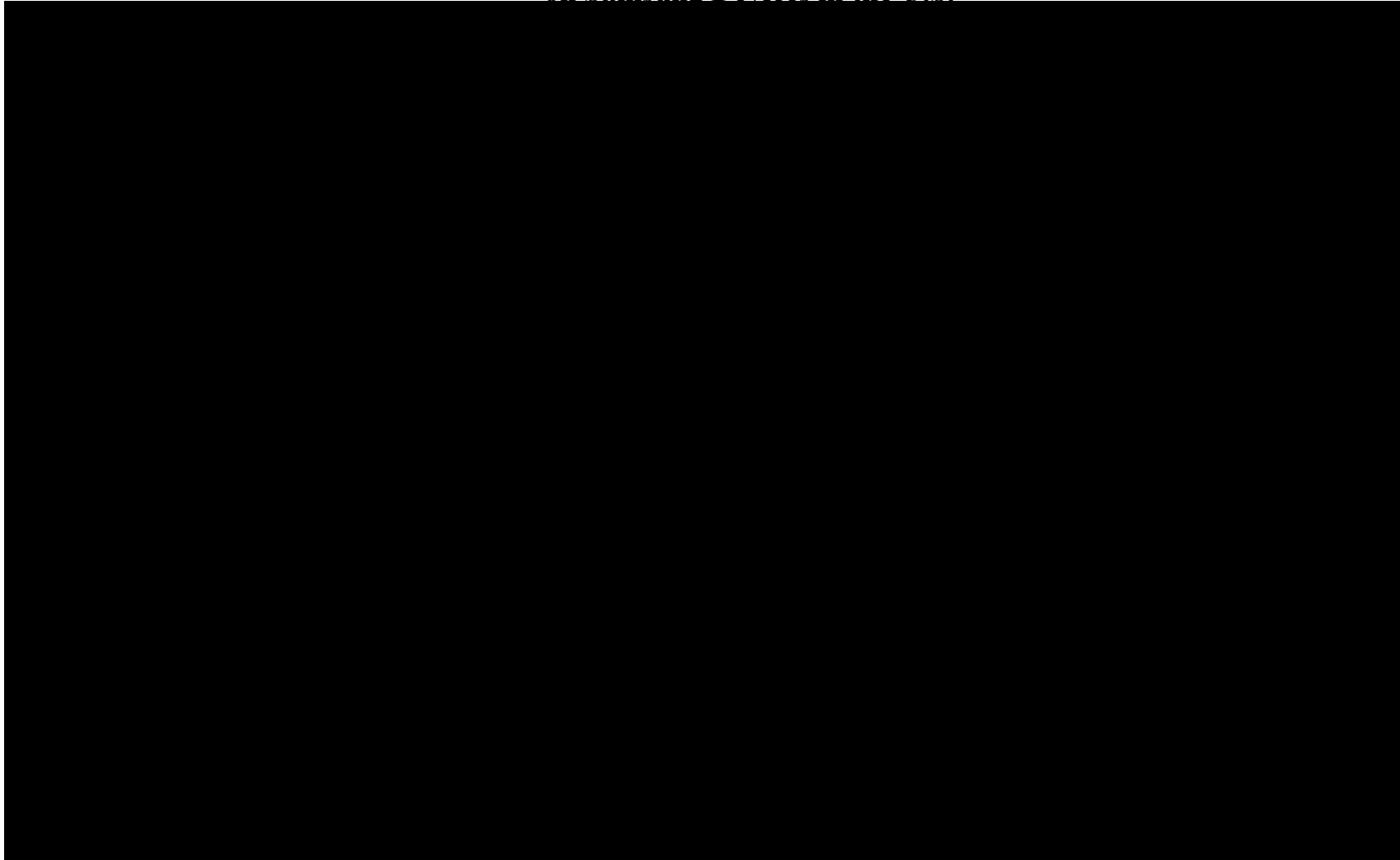
Sources:
[1] SEA_GOOGLE_00000720; GOOG-PLAY-005535886.

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Exhibit 15a

Monthly Total Number of Apps with Non-Zero Sales
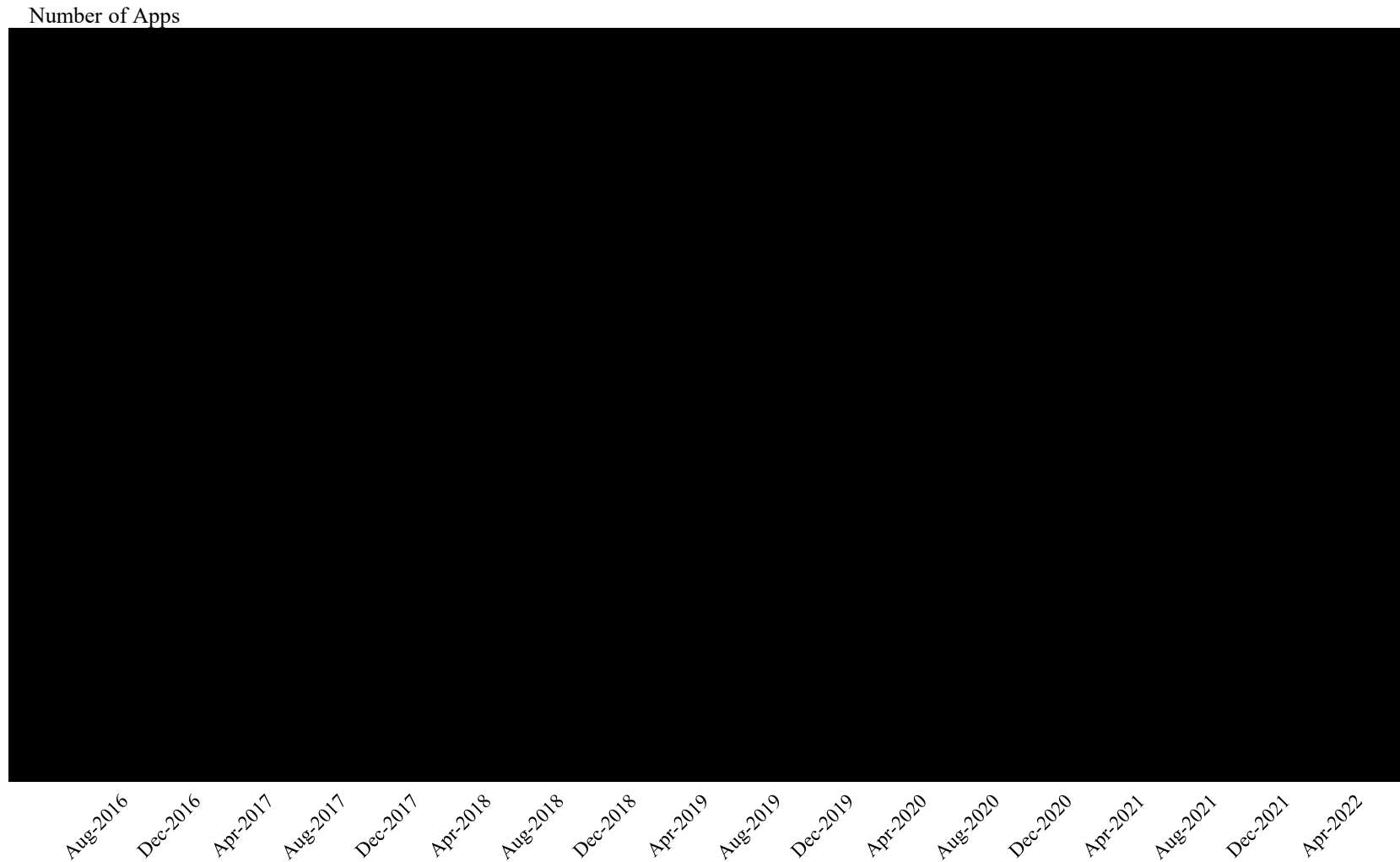
Number of Apps

Aug-2016 Dec-2016 Apr-2017 Aug-2017 Dec-2017 Apr-2018 Aug-2018 Dec-2018 Apr-2019 Aug-2019 Dec-2019 Apr-2020 Aug-2020 Dec-2020 Apr-2021 Aug-2021 Dec-2021 Apr-2022

Source:
[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 15b

Growth Rate of the Monthly Total Number of Apps with Non-Zero Sales

Growth Rate

Aug-2016 Dec-2016 Apr-2017 Aug-2017 Dec-2017 Apr-2018 Aug-2018 Dec-2018 Apr-2019 Aug-2019 Dec-2019 Apr-2020 Aug-2020 Dec-2020 Apr-2021 Aug-2021 Dec-2021 Apr-2022
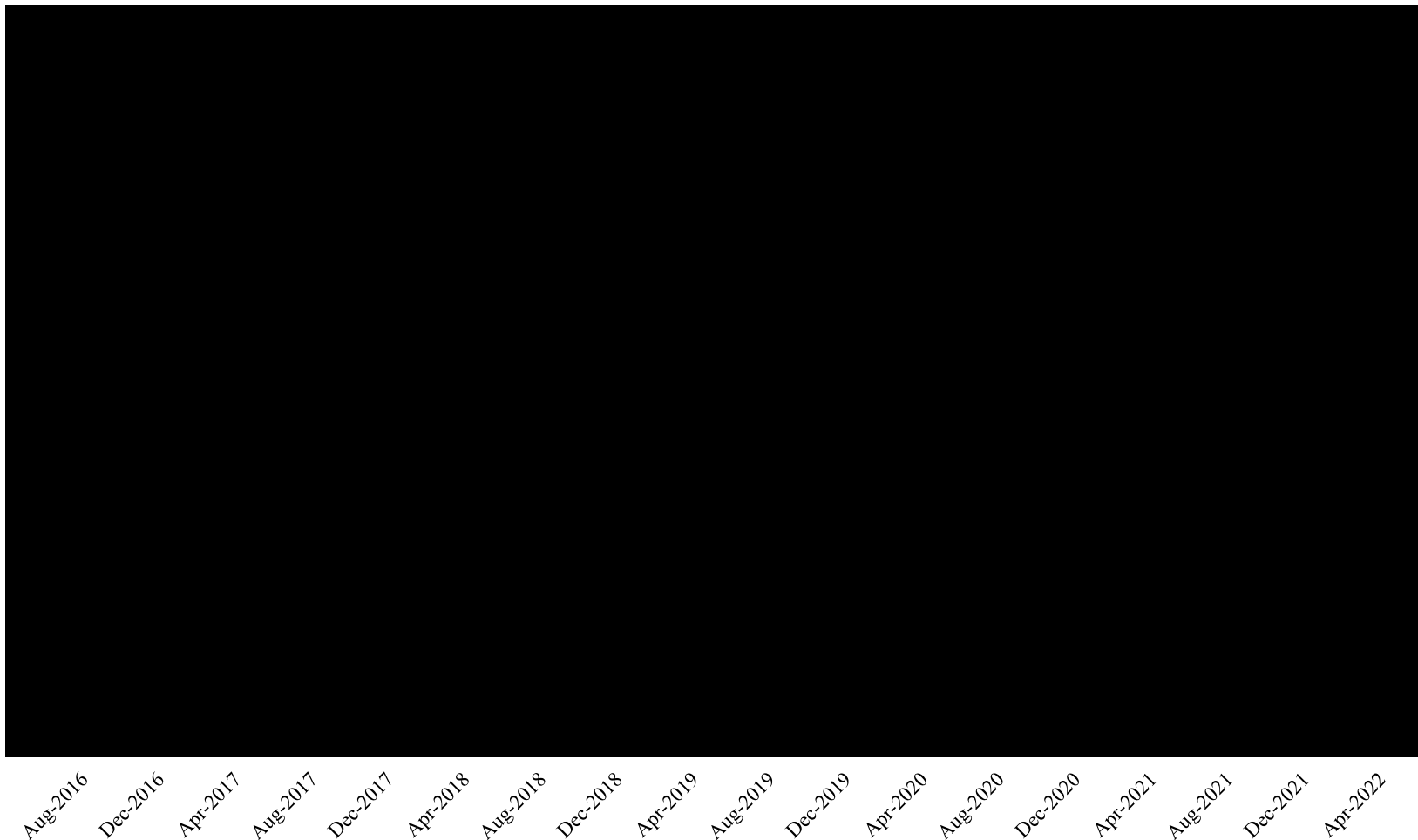
Note:
[1] Growth rate is calculated as the percentage change of monthly total number of apps with non-zero sales from the previous month.

Source:
[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 16

Service Fee Rate Benchmarks Proposed by Dr. Singer and Dr. Rysman
App Distribution

Category	Benchmark	Service Fee Rate	Proposed by Dr. Singer	Proposed by Dr. Rysman
Alternative Android App Stores	ONE Store	5-20%	Yes	Yes
	Aptoide	10-25%	Yes	Yes
	Amazon Appstore	18%	Yes	Yes
	Galaxy Store	30%	No	Yes
	Game Jolt Store (Mobile)	0 to 10%	No	Yes
PC App Stores	Microsoft	5% for non-game and non-Xbox apps 0% for non-game PC apps if apps utilize its own or a 3P payment system	Yes	Yes
	Chrome Web Store	5% if using Chrome Web Store API 30% for in-app payments for ARC apps	Yes	Yes
	Game Jolt Store	0-10%	No	Yes
PC Game Platforms	Microsoft (Game)	12% for PC games 30% for Xbox console games [1]	Yes	Yes
	Steam	20-30%	Yes	Yes
	Epic Games Store	12% for all games	Yes	Yes
	Discord	10%	Yes	Yes
Other Two-Sided Platforms	Substack (Online publishing platform)	10% + credit card fee	Yes	No
	Revue (Online publishing platform)	5%	Yes	No
	Amazon	8%-15% + $0.99/item or $39.99/month	Yes	No
	eBay	12.55% + $0.35	Yes	No
	Etsy	8% + $0.45	Yes	No

Note:

[1] Xbox is listed in relation to the Microsoft Store in Rysman Exhibit 68.

Sources:

[1] Rysman Report Exhibits 68 - 69; ¶¶ 477.

[2] Singer Report Table 7; ¶¶ 314.

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Exhibit 17

Summary of Selected Online Platform Service Fees
With Service Fee Rates At or Above 30%

Platform Type	Platform	Service Fee Rate	Notes
Game Console Store	Microsoft Store for Xbox	30%	15% for non-video game subscriptions. 15% for non-Xbox purchases (except certain Business, Education, and Games apps on Windows 8).
	Nintendo E-Shop	30%	
	PlayStation Store	30%	
PC Gaming Store	Steam	30%	25% for sales between $10 million and $50 million. 20% for sales greater than $50 million.
Mobile App Store	Samsung Galaxy Store	30%	
	Amazon Appstore	30%	20% for app developers with less than $1 million in app revenue, plus 10% of revenue as credit for AWS.
Book and Audiobook Publishing	Audible-ACX	60% or 75%	Commission rates are increased for audiobooks which are not exclusively distributed.
	Kindle Direct Publishing	30% or 65%	Kindle Direct publishers may choose between a "35% Royalty Option" and a "70% Royalty Option."

Sources:

[1] "Terms and Conditions," Samsung Galaxy Store Seller Portal, https://seller.samsungapps.com/help/termsAndConditions.as.

[2] "Coming soon: Amazon Appstore Small Business Accelerator Program," Amazon Appstore, June 15, 2021, https://developer.amazon.com/apps-and-games/blogs/2021/06/small-business-accelerator-program.

[3] "Amazon's Appstore lowers its cut of developer revenue for small businesses, adds AWS credits," Tech Crunch, June 17, 2021, https://www.techcrunch.com/2021/06/17/amazons-appstore-lowers-its-cut-of-developer-revenue-for-small-businesses-adds-aws-credits/

[4] "Production Earnings and Costs," ACX, https://www.acx.com/help/what-s-the-deal/200497690.

[5] "eBook Royalties," Kindle Direct Publishing, https://kdp.amazon.com/en_US/help/topic/G200644210.

[6] Borck, Caminade, and Wartburg, "Apple's App Store and Other Digital Marketplaces," Analysis Group, July 22, 2020.

Exhibit 18

Monthly Consumer Class Damages
From Changes in the Service Fee Rate (USD)

Year	Month	Consumer Damages from Overcharge
2016	8.16 - 8.31	
2016	9	
2016	10	
2016	11	
2016	12	
2017	1	
2017	2	
2017	3	
2017	4	
2017	5	
2017	6	
2017	7	
2017	8	
2017	9	
2017	10	
2017	11	
2017	12	
2018	1	
2018	2	
2018	3	
2018	4	
2018	5	
2018	6	
2018	7	
2018	8	
2018	9	
2018	10	
2018	11	
2018	12	
2019	1	
2019	2	
2019	3	
2019	4	
2019	5	
2019	6	
2019	7	
2019	8	
2019	9	
2019	10	
2019	11	
2019	12	

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Exhibit 18

Monthly Consumer Class Damages
From Changes in the Service Fee Rate (USD)

Year	Month	Consumer Damages from Overcharge
2020	1	███
2020	2	███
2020	3	███
2020	4	███
2020	5	███
2020	6	███
2020	7	███
2020	8	███
2020	9	███
2020	10	███
2020	11	███
2020	12	███
2021	1	███
2021	2	███
2021	3	███
2021	4	███
2021	5	███
2021	6	███
2021	7	███
2021	8	███
2021	9	███
2021	10	███
2021	11	███
2021	12	███
2022	1	███
2022	2	███
2022	3	███
2022	4	███
2022	5	███
September 1, 2018 - May 31, 2022		███
August 16, 2016 - May 31, 2022		███

Notes:

[1] But-for service fee rate is calculated based on the period of January 2022 - May 2022, and then applied to the corresponding starting time point till December 2021.

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 19

Monthly Consumer Class Damages
From Changes in Consumer Subsidies (USD)

Year	Month	Consumer Damages from Play Points	Consumer Damages from Non-Points Google Discounts	Consumer Damages (Combined)
2016	8.16 - 8.31			
2016	9			
2016	10			
2016	11			
2016	12			
2017	1			
2017	2			
2017	3			
2017	4			
2017	5			
2017	6			
2017	7			
2017	8			
2017	9			
2017	10			
2017	11			
2017	12			
2018	1			
2018	2			
2018	3			
2018	4			
2018	5			
2018	6			
2018	7			
2018	8			
2018	9			
2018	10			
2018	11			
2018	12			
2019	1			
2019	2			
2019	3			
2019	4			
2019	5			
2019	6			
2019	7			
2019	8			
2019	9			
2019	10			
2019	11			
2019	12			

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Exhibit 19

Monthly Consumer Class Damages
From Changes in Consumer Subsidies (USD)

Year	Month	Consumer Damages from Play Points	Consumer Damages from Non-Points Google Discounts	Consumer Damages (Combined)
2020	1			
2020	2			
2020	3			
2020	4			
2020	5			
2020	6			
2020	7			
2020	8			
2020	9			
2020	10			
2020	11			
2020	12			
2021	1			
2021	2			
2021	3			
2021	4			
2021	5			
2021	6			
2021	7			
2021	8			
2021	9			
2021	10			
2021	11			
2021	12			
2022	1			
2022	2			
2022	3			
2022	4			
2022	5			
September 1, 2018 - May 31, 2022				
August 16, 2016 - May 31, 2022				

Notes:

[1] But-for Play Points rate and but-for Google offered non-Points discount rate are calculated based on the period of November 4, 2019 - May 31, 2022, and then applied to the corresponding starting time point till November 3, 2019.

[2] Consumer damages in November 2019 from changes in consumer subsidies (Play Points and non-Points discounts) are for the period of November 1, 2019 - November 3, 2019 before the Play Points program launched in the U.S.

[2] The amount of Play Points offered is adjusted downward by ▇ when calculating the actual and but-for Points discount rates to account for Points expiration.

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 20

Service Fee Rates of Top Android Mobile App Stores in China

App Store	Service Fee Rate	Effective Service Fee Rate
Huawei Mobile App Store [1]	▪ **Channel fee**: 2% (as of March 1, 2022)	
	▪ **Paid downloads**: 30%	(1-2%) x 30% + 2% = 31.4%
	▪ **IAPs or digital content purchases (subscriptions included)**: 50% for games, 30% for other categories, 20% for education apps	Games: 51%; other: 31.4%; education apps: 21.6%
	▪ **Paid downloads**: 20% for education apps (as of December 1, 2019)	(1-2%) x 20% + 2% = 21.6%
Tencent Mobile App Store [2]	▪ **Channel fee**: 25%	
	▪ **Game apps (joint operation)**: 40%	(1-25%) x 40% + 25% = 55%
	▪ **Historical tiered rates for game apps (as of 2014)**: 30% for game apps under "open access" operating mode and 40% for game apps under "joint operation" operating mode	47.5% for game apps under "open access" operating mode and 55% or game apps under "joint operation" operating mode
	▪ **Historical tiered rates (as of 2012):** 0% of monthly revenue amount below ¥100,000, 30% of monthly revenue between ¥100,000 to ¥1,000,000, and 50% of monthly revenue between ¥1,000,000 to ¥10,000,000.	Tiered rates: 25%, 47.5%, 62.5%
OPPO Mobile App Store [3]	▪ **Channel fee**: 5%	
	▪ **Game apps (joint operation)**: 50%	(1-5%) x 50% + 5% = 52.5%
	▪ **Game apps**: Tiered rates of 0% of monthly revenue amount below ¥100,000, 30% of amount between ¥100,000 to ¥500,000, and 50% of amount over ¥500,000	Tiered rates: 5%, 33 5%, 52.5%
Vivo Mobile App Store [4]	▪ **Channel fee**: 5%	
	▪ **Game Apps (joint operation)**: 50%	(1-5%) x 50% + 5% = 52.5%
	▪ **Game Apps ("Independent Game Spark Plan" as of June 2018)**: Tiered rates of 0% of monthly revenue amount below ¥100,000, 30% of amount between ¥100,000 to ¥500,000, and 50% of amount over ¥500,000.	Tiered rates: 5%, 33 5%, 52.5%
Xiaomi Mobile App Store [5]	▪ **Channel fee**: 5%	
	▪ **Game apps**: 50%	(1-5%) x 50% + 5% = 52.5%
	▪ **Game apps (tablet games)**: 30% (as of August 2015)	(1-5%) x 30% + 5% = 33.5%
360 Mobile App Store [6]	▪ **Channel fee**: 20%	
	▪ **Game Apps**: Tiered rate structure of 0% of monthly revenue amount below ¥100,000, 25% of monthly revenue amount between ¥100,000 to ¥1,000,000, 50% of monthly revenue amount between ¥1,000,000 to ¥5,000,000, and 55% of monthly revenue amount over ¥5,000,000	Tiered rates: (1-20%) x 0% + 20% = 20% (1-20%) x 25% + 20% = 40% (1-20%) x 50% + 20% = 60% (1-20%) x 55% + 20% = 64%
Baidu Mobile App Store [7]	▪ **Channel fee**: 5%	
	▪ **Game Apps (Q Coin, for IAP)**: Tiered rate structure of 30% of monthly revenue amount below ¥500,000 and 50% of monthly revenue amount over ¥500,000.	Tiered rates: (1-5%) x 30% + 5% = 33.5% (1-5%) x 50% + 5% = 52.5%
WeChat mini-program [8]	▪ **Game Apps IAP**: 40% for regular games and 30% for "innovative" games	40% or 30%
ByteDance mini-program [9]	▪ **Channel fee**: 5%	
	▪ **Game Apps IAP**: Tiered rate structure of 40% of monthly revenue amount below ¥500,000 and 30% of monthly revenue amount over ¥500,000.	Tiered rates: (1-5%) x 40% + 5% = 43% (1-5%) x 30% + 5% = 33.5%

Notes:

[1] Huawei mobile app store service fee rate: "AppGallery Joint Operations Service Agreement," January 26, 2022, https://terms-drcn platform dbankcloud cn/agreementservice/developer/getAgreementTemplate?agrType=1005&country=cn&language=zh_cn& version=2022012602 See an earlier February 23, 2020 version in English at https://developer huawei com/consumer/en/doc/30203#h1-1582512387270 Payment channel fee rate: "HUAWEI Developer Merchant Service Agreement," https://developer huawei com/consumer/en/doc/start/merchantserviceagreement-0000001052848245#EN-US_TOPIC_0000001052848245 __section17986481491; "Deductions for Payment Channels," https://developer huawei com/consumer/en/doc/00002

[2] Tencent mobile app store service fee rates for joint operation game apps: https://wikinew open qq com/#/iwiki/813395318 Tencent mobile app store historical tiered service fee rates for game apps (as of 2014): http://it people com cn/n/2014/0307/c1009-24555378 html Tencent mobile app store historical tiered service fee rates for game apps (as of 2012): http://news cntv cn/20120107/109143 shtml

[3] OPPO mobile app store service fee rates for joint operation game apps: https://open oppomobile com/new/developmentDoc/info?id=10987

[4] Vivo mobile app store service fee rates for joint operation game apps: https://dev vivo com cn/documentCenter/doc/251 Vivo mobile app store "Independent Game Spark Plan" as of June 2018: https://dev vivo com cn/activityPage/21

[5] Xiaomi mobile app store service fee rates for game apps: https://dev mi com/console/doc/detail?pId=729 Xiaomi mobile app store service fee rates for tablet and TV games: https://www leiphone com/category/zixun/xCKPRyPmX3Hf2fZN html

[6] 360 mobile app store service fee rates for game apps: http://opengame 360 cn/wiki/8

[7] Baidu mobile app store service fee rates: http://dev mgame baidu com/yyjr/js

[8] Mini-program games are games to be played without downloading the app Hence all sales are from in-app purchases WeChat mini-program service fee rates for games: https://developers weixin qq com/community/minigame/doc/000caa83cbcc30717f5dea01f5b408

[9] Mini-program games are games to be played without downloading the app Hence all sales are from in-app purchases https://microapp bytedance com/docs/zh-CN/mini-game/operation/game-revenue/mini-game-revenue-sharing-clause/

Exhibit 21

Restitution From Changes in the Service Fee Rate (in Millions USD)

Description	Calculation	Profits-Based Restitution	Revenue-Based Restitution	Source
Actual Google Play Apps & Games Revenue	[A]			Solomon Report, Schedule 5
Actual Service Fee Rate	*[1]*			Google Play Transactions Data
But-for Service Fee Rate	*[2]*			Estimated, See Section XI A
Actual Play Points %	*[3]*			Google Play Transactions Data
But-for Play Points %	*[4]*			Same as Actual
Actual Google Discount %	*[5]*			Google Play Transactions Data
But-for Google Discount %	*[6]*			Same as Actual
Pass-through Rate	*[7]*			Empirical Estimate, See Exhibit 5
Percentage Reduction in Per-Unit Apps & Games Revenue	[B]			Calculated based on [1] - [7]
But-For Google Play App & Game Revenue	[C] = [A]*(1-[B])			Calculated
Actual Google Play Other Revenue	[D]			Solomon Report, Schedule 5
But-For Google Play Revenue	[E] = [C]+[D]			Calculated
Actual Google Play Operating Profit Margin for App & Games	[F]			Solomon Report, Schedule 5
But-For Google Play App & Games Costs	[G] = [C]*(1-[F])			Calculated
Actual Google Play Other Costs	[H]			Solomon Report, Schedule 5
But-for Total Google Play Costs	[I] = [G]+[H]			Calculated
But-For Incremental Profits	[J] = [E]-[I]			Calculated
Actual Incremental Profits	[K]			Solomon Report, Schedule 2
Excess Profits	[L 1] = [K]-[J]			Calculated
Consumer Savings	[L 2] = [A]-[E]			Calculated
Pass-through Rate	[M]			Empirical Estimate, See Exhibit 5
Consumer Restitution (Worldwide)	[L]*[M]			**Calculated**
Geographic Area				
US	Allocated			
39 States	Allocated			
1 Alaska	Allocated			
2 Arizona	Allocated			
3 Arkansas	Allocated			
4 California	Allocated			
5 Colorado	Allocated			
6 Connecticut	Allocated			
7 Delaware	Allocated			
8 District of Columbia	Allocated			
9 Florida	Allocated			
10 Idaho	Allocated			
11 Indiana	Allocated			
12 Iowa	Allocated			
13 Kentucky	Allocated			
14 Louisiana	Allocated			
15 Maryland	Allocated			
16 Massachusetts	Allocated			
17 Minnesota	Allocated			
18 Mississippi	Allocated			
19 Missouri	Allocated			
20 Montana	Allocated			
21 Nebraska	Allocated			
22 Nevada	Allocated			
23 New Hampshire	Allocated			
24 New Jersey	Allocated			
25 New Mexico	Allocated			
26 New York	Allocated			
27 North Carolina	Allocated			
28 North Dakota	Allocated			
29 Oklahoma	Allocated			
30 Oregon	Allocated			
31 Rhode Island	Allocated			
32 South Dakota	Allocated			
33 Tennessee	Allocated			
34 Texas	Allocated			
35 Utah	Allocated			
36 Vermont	Allocated			
37 Virginia	Allocated			
38 Washington	Allocated			
39 West Virginia	Allocated			

Notes:

[1] Worldwide restitution is allocated to the US and the plaintiff states using weights from Solomon Schedule 60 (Summary of Pre-Tax Sales Revenue Distributed to Google by Geographic Area in the US, 2011 - 2021) and Schedule 61 (Pro-Rata of Pre-Tax Sales Revenue Distributed to Google by Geographic Area in the US)

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260

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Exhibit 22

Restitution From Changes in the Consumer Subsidy (in Millions USD)

Description	Calculation	Profits-Based Restitution	Revenue-Based Restitution	Source
Actual Google Play Store Consumer Spend	[A]			Solomon Report, Schedule 4
Actual Service Fee Rate	*[1]*			Google Play Transactions Data
But-for Service Fee Rate	*[2]*			Same as Actual
Actual Play Points %	*[3]*			Google Play Transactions Data
But-for Play Points %	*[4]*			Estimated, See Section XI B
Actual Google Discount %	*[5]*			Google Play Transactions Data
But-for Google Discount %	*[6]*			Estimated, See Section XI B
Actual Developer Discount	*[7]*			Google Play Transactions Data
Percentage Reduction in Per-Unit Consumer Spend	[B]			Calculated based on [1] - [7]
Reduction in App & Games Revenue	[A]*[B]			Calculated
Actual Google Play Apps & Games Revenue	[C]			Solomon Report, Schedule 5
Actual Google Play Other Revenue	[D]			Solomon Report, Schedule 5
But-For Google Play Revenue	[E] = [C]-[A]*[B]+[D]			Calculated
Actual Google Play Operating Profit Margin for App & Games	[F]			Solomon Report, Schedule 5
But-For Google Play App & Games Costs	[G]=([C]-[A]*[B])*(1-[F])			Calculated
Actual Google Play Other Costs	[H]			Solomon Report, Schedule 5
But-for Total Google Play Costs	[I] = [G]+[H]			Calculated
But-For Incremental Profits	[J] = [E]-[I]			Calculated
Actual Incremental Profits	[K]			Solomon Report, Schedule 2
Excess Profits	[L 1] = [K]-[J]			Calculated
Consumer Savings	[L 2] = [C]-[E]			Calculated
Pass-through Rate	[M]			
Consumer Restitution (Worldwide)	[L]*[M]			**Calculated**
Geographic Area				
US	Allocated			
39 States	Allocated			
1 Alaska	Allocated			
2 Arizona	Allocated			
3 Arkansas	Allocated			
4 California	Allocated			
5 Colorado	Allocated			
6 Connecticut	Allocated			
7 Delaware	Allocated			
8 District of Columbia	Allocated			
9 Florida	Allocated			
10 Idaho	Allocated			
11 Indiana	Allocated			
12 Iowa	Allocated			
13 Kentucky	Allocated			
14 Louisiana	Allocated			
15 Maryland	Allocated			
16 Massachusetts	Allocated			
17 Minnesota	Allocated			
18 Mississippi	Allocated			
19 Missouri	Allocated			
20 Montana	Allocated			
21 Nebraska	Allocated			
22 Nevada	Allocated			
23 New Hampshire	Allocated			
24 New Jersey	Allocated			
25 New Mexico	Allocated			
26 New York	Allocated			
27 North Carolina	Allocated			
28 North Dakota	Allocated			
29 Oklahoma	Allocated			
30 Oregon	Allocated			
31 Rhode Island	Allocated			
32 South Dakota	Allocated			
33 Tennessee	Allocated			
34 Texas	Allocated			
35 Utah	Allocated			
36 Vermont	Allocated			
37 Virginia	Allocated			
38 Washington	Allocated			
39 West Virginia	Allocated			

Notes:

[1] Worldwide restitution is allocated to the US and the plaintiff states using weights from Solomon Schedule 60 (Summary of Pre-Tax Sales Revenue Distributed to Google by Geographic Area in the US, 2011 - 2021) and Schedule 61 (Pro-Rata of Pre-Tax Sales Revenue Distributed to Google by Geographic Area in the US)

Source:

[1] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260

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Exhibit 23

Disgorgement From Changes in the Service Fee Rate (in Millions USD)

Description	Calculation	Calculation 1 (ONE Store-Based But-for Market Share)	Calculation 2 (But-for Market Share Same as Actual)	Source
Actual Google Play Apps & Games Revenue	[A]			Solomon Report, Schedule 5
Actual Service Fee Rate	*[1]*			Google Play Transactions Data
But-for Service Fee Rate	*[2]*			Estimated, See Section XI A
Actual Play Points %	*[3]*			Google Play Transactions Data
But-for Play Points %	*[4]*			Same as Actual
Actual Google Discount %	*[5]*			Google Play Transactions Data
But-for Google Discount %	*[6]*			Same as Actual
Pass-through Rate	*[7]*			Empirical Estimate, See Exhibit 5
Percentage Reduction in Per-Unit Apps & Games Revenue	[B]			Calculated based on [1] - [7]
Subtotal	[C] = [A]*(1-[B])			Calculated
Demand Elasticity	*[8]*			Singer Merits Report, Table 8
Increase in Market Sales Quantity	[D]			Calculated based on [1] - [2], [8]
But-For Market App & Game Revenue	[E] = [C]*(1+[D])			Calculated
Actual Market Share	[F]			Singer Merits Report, ¶122
But-For Market Share	[G]			Empirical Evidence/Assumption
But-For Google Play App & Game Revenue	[H] = [E]/[F]*[G]			Calculated
Actual Google Play Other Revenue	[I]			Solomon Report, Schedule 5
But-for Google Play Total Revenue	[J] = [H]+[I]			Calculated
Actual Google Play Operating Profit Margin for App & Games	[K]			Solomon Report, Schedule 5
But-For Google Play App & Games Costs	[L] = [H]*(1-[K])			Calculated
Actual Google Play Other Costs	[M]			Solomon Report, Schedule 5
But-for Total Google Play Costs	[N] = [L]+[M]			Calculated
But-For Incremental Profits	[O] = [J]-[N]			Calculated
Actual Incremental Profits	[P]			Solomon Report, Schedule 2
Disgorgement (Worldwide)	[P] - [O]			**Calculated**
Geographic Area				
US	Allocated			
39 States	Allocated			
1 Alaska	Allocated			
2 Arizona	Allocated			
3 Arkansas	Allocated			
4 California	Allocated			
5 Colorado	Allocated			
6 Connecticut	Allocated			
7 Delaware	Allocated			
8 District of Columbia	Allocated			
9 Florida	Allocated			
10 Idaho	Allocated			
11 Indiana	Allocated			
12 Iowa	Allocated			
13 Kentucky	Allocated			
14 Louisiana	Allocated			
15 Maryland	Allocated			
16 Massachusetts	Allocated			
17 Minnesota	Allocated			
18 Mississippi	Allocated			
19 Missouri	Allocated			
20 Montana	Allocated			
21 Nebraska	Allocated			
22 Nevada	Allocated			
23 New Hampshire	Allocated			
24 New Jersey	Allocated			
25 New Mexico	Allocated			
26 New York	Allocated			
27 North Carolina	Allocated			
28 North Dakota	Allocated			
29 Oklahoma	Allocated			
30 Oregon	Allocated			
31 Rhode Island	Allocated			
32 South Dakota	Allocated			
33 Tennessee	Allocated			
34 Texas	Allocated			
35 Utah	Allocated			
36 Vermont	Allocated			
37 Virginia	Allocated			
38 Washington	Allocated			
39 West Virginia	Allocated			

Notes:
[1] Worldwide disgorgement is allocated to the US and the plaintiff states using weights from Solomon Schedule 60 (Summary of Pre-Tax Sales Revenue Distributed to Google by Geographic Area in the US, 2011 - 2021) and Schedule 61 (Pro-Rata of Pre-Tax Sales Revenue Distributed to Google by Geographic Area in the US).
[2] Calculation 1 uses ███% for Google Play's actual market share and ███ for but-for market share (15% reduction from ███, based on that ONE Store gained up to 15% after entry in South Korea).
[3] Calculation 2 assumes the actual and but-for Google Play market shares to be the same, ███

Source:
[1] Google Play transactions data GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 24

Disgorgement From Changes in the Consumer Subsidy (in Millions USD)

Description	Calculation	Calculation 1 (ONE Store-Based But-for Market	Calculation 2 (But-for Market Share Same as	Source
Actual Google Play Store Consumer Spend	[A]			Solomon Report, Schedule 4
Actual Service Fee Rate	*[1]*			Google Play Transactions Data
But-for Service Fee Rate	*[2]*			Same as Actual
Actual Play Points %	*[3]*			Google Play Transactions Data
But-for Play Points %	*[4]*			Estimated, See Section XI B
Actual Google Discount %	*[5]*			Google Play Transactions Data
But-for Google Discount %	*[6]*			Estimated, See Section XI B
Actual Developer Discount	*[7]*			Google Play Transactions Data
Percentage Reduction in Per-Unit Consumer Spend	[B]			Calculated based on [3] - [7]
Reduction in App & Games Revenue	[A]*[B]			Calculated
Demand Elasticity	*[8]*			Singer Merits Report, Table 8
Increase in Market Sales Quantity	[C]			Calculated based on [3] - [8]
Actual Google Play Apps & Games Revenue	[D]			Solomon Report, Schedule 5
But-For Market App & Game Revenue	[E] = ([D]-[A]*[B])*(1+[C])			Calculated
Actual Market Share	[F]			Singer Merits Report, ¶122
But-For Market Share	[G]			Empirical Evidence/Assumption
But-For Google Play App & Game Revenue	[H] = [E]/[F]*[G]			Calculated
Actual Google Play Other Revenue	[I]			Solomon Report, Schedule 5
But-for Google Play Total Revenue	[J] = [H]+[I]			Calculated
Actual Google Play Operating Profit Margin for App & Games	[K]			Solomon Report, Schedule 5
But-For Google Play App & Games Costs	[L] = [H]*(1-[K])			Calculated
Actual Google Play Other Costs	[M]			Solomon Report, Schedule 5
But-for Total Google Play Costs	[N] = [L]+[M]			Calculated
But-For Incremental Profits	[O] = [J]-[N]			Calculated
Actual Incremental Profits	[P]			Solomon Report, Schedule 2
Disgorgement (Worldwide)	[P] - [O]			**Calculated**
Geographic Area				
US	Allocated			
39 States	Allocated			
1 Alaska	Allocated			
2 Arizona	Allocated			
3 Arkansas	Allocated			
4 California	Allocated			
5 Colorado	Allocated			
6 Connecticut	Allocated			
7 Delaware	Allocated			
8 District of Columbia	Allocated			
9 Florida	Allocated			
10 Idaho	Allocated			
11 Indiana	Allocated			
12 Iowa	Allocated			
13 Kentucky	Allocated			
14 Louisiana	Allocated			
15 Maryland	Allocated			
16 Massachusetts	Allocated			
17 Minnesota	Allocated			
18 Mississippi	Allocated			
19 Missouri	Allocated			
20 Montana	Allocated			
21 Nebraska	Allocated			
22 Nevada	Allocated			
23 New Hampshire	Allocated			
24 New Jersey	Allocated			
25 New Mexico	Allocated			
26 New York	Allocated			
27 North Carolina	Allocated			
28 North Dakota	Allocated			
29 Oklahoma	Allocated			
30 Oregon	Allocated			
31 Rhode Island	Allocated			
32 South Dakota	Allocated			
33 Tennessee	Allocated			
34 Texas	Allocated			
35 Utah	Allocated			
36 Vermont	Allocated			
37 Virginia	Allocated			
38 Washington	Allocated			
39 West Virginia	Allocated			

Notes:

[1] Worldwide disgorgement is allocated to the US and the plaintiff states using weights from Solomon Schedule 60 (Summary of Pre-Tax Sales Revenue Distributed to Google by Geographic Area in the US, 2011 - 2021) and Schedule 61 (Pro-Rata of Pre-Tax Sales Revenue Distributed to Google by Geographic Area in the US).

[2] Calculation 1 uses ▮▮▮ for Google Play's actual market share and ▮▮▮ for but-for market share (15% reduction from 85.9%, based on that ONE Store gained up to 15% after entry in South Korea).

[3] Calculation 2 assumes the actual and but-for Google Play market shares to be the same, ▮▮▮.

Source:

[1] Google Play transactions data GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 25

Summary of the Match Plaintiffs' Damages for OkCupid and Tinder
Using Dr. Schwartz's Damages Model

		Main Damages Period		Alternative Damages Period		1/1/2022 — 5/20/2022	
		Base Case	High Rate	Base Case	High Rate	Base Case	High Rate
Dr. Schwartz's Calculations	OkCupid						
	Tinder						
	Total						
Dr. Schwartz's Calculations After Correcting for Mishandling of Google Play Transactions Data	OkCupid						
	Tinder						
	Total						
Sensitivity Analysis #1	OkCupid						
	Tinder						
	Total						
Sensitivity Analysis #2	OkCupid						
	Tinder						
	Total						
Sensitivity Analysis #3	OkCupid						
	Tinder						
	Total						
Sensitivity Analysis #4	OkCupid						
	Tinder						
	Total						
Sensitivity Analysis #5	OkCupid						
	Tinder						
	Total						
Sensitivity Analysis #6	OkCupid						
	Tinder						
	Total						

Notes:
[1] See Exhibits 26a-26d for Dr. Schwartz's calculations after correcting for mishandling of Google Play transactions data.
[2] See Exhibits 27a-27d for Sensitivity Analysis #1.
[3] See Exhibits 28a-28d for Sensitivity Analysis #2.
[4] See Exhibits 29a-29d for Sensitivity Analysis #3.
[5] See Exhibits 30a-30d for Sensitivity Analysis #4.
[6] See Exhibits 31a-31d for Sensitivity Analysis #5.
[7] See Exhibits 32a-32d for Sensitivity Analysis #6.

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Exhibit 25

Sources:

[1] Exhibits 26a, 26b.
[2] Exhibits 27a, 27b.
[3] Exhibits 28a, 28b.
[4] Exhibits 29a, 29b.
[5] Exhibits 30a, 30b.
[6] Exhibits 31a, 31b.
[7] Exhibits 32a, 32b.
[8] Attachment E-6, Expert Report of Dr. Schwartz, October 3, 2022.
[9] Attachment F-6, Expert Report of Dr. Schwartz, October 3, 2022.
[10] Attachment G-4, Expert Report of Dr. Schwartz, October 3, 2022.

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Exhibit 26a

OkCupid's and Tinder's Damages During the Main and Alternative Damages Periods

Dr. Schwartz's Damages Model: Correcting for Mishandling of Google Play Transactions Data

Damages Scenario	Application	Actual Service Fees Incurred from Google Play's Billing System	But-For Service Fees				Total Damages
			Play Discovery Value	But-For Form of Payment Fees	Play Delivery Value	Total	
Main Damages Period Base Case	OkCupid						
	Tinder						
	Total						
Main Damages Period High Rate	OkCupid						
	Tinder						
	Total						
Alternative Damages Period Base Case	OkCupid						
	Tinder						
	Total						
Alternative Damages Period High Rate	OkCupid						
	Tinder						
	Total						

Notes:

[1] The main damages period starts on July 7, 2017 and ends on December 31, 2021. The alternative damages period starts on May 9, 2018 and ends on December 31, 2021.

[2] The Base Case scenario uses OkCupid's and Tinder's historic rate from their own payment processing systems, ▮▮▮ and ▮▮▮ respectively, to compute the but-for Form of Payment fees.

[3] The High Rate scenario uses the most common effective rates of alternative payment processing providers for Tinder (4.7%) to compute the but-for Form of Payment fees.

Sources:

[1] Exhibit 26c.

[2] Exhibits 34a, 34d, 34e, 34g.

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Exhibit 26b

OkCupid's and Tinder's Damages During 2022

Dr. Schwartz's Damages Model: Correcting for Mishandling of Google Play Transactions Data

Damages Scenario	Application	Estimated Service Fees Incurred from Google Play's Billing System	Play Discovery Value	But-For Service Fees			Total Damages
				But-For Form of Payment Fees	Play Delivery Value	Total	
1/1/2022 – 5/20/2022 Base Case	OkCupid Tinder						
	Total						
1/1/2022 – 5/20/2022 High Rate	OkCupid Tinder						
	Total						

Notes:

[1] The Base Case scenario uses OkCupid's and Tinder's historic rate from their own payment processing systems, ███ and ███ respectively, to compute the but-for Form of Payment fees.

[2] The High Rate scenario uses the most common effective rates of alternative payment processing providers for Tinder (███) to compute the but-for Form of Payment fees.

Sources:

[1] Exhibit 26d.

[2] Exhibits 34h, 34i.

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Exhibit 26c

Discovery Value Per Install to OkCupid and Tinder
Dr. Schwartz's Damages Model: Correcting for Mishandling of Google Play Transactions Data

Metric	OkCupid	Tinder

Notes:

[1] ███
███████████

[2] The Android application revenue includes revenue processed through Google Play's billing system, as well as Android revenue processed through alternative billing systems provided the app was downloaded from Play.

[3] ███

[4] ███
██████████████████████████████████████

Sources:

[1] GOOG-PLAY-000337564.
[2] GOOG-PLAY-001127244.
[3] Exhibit 34e.

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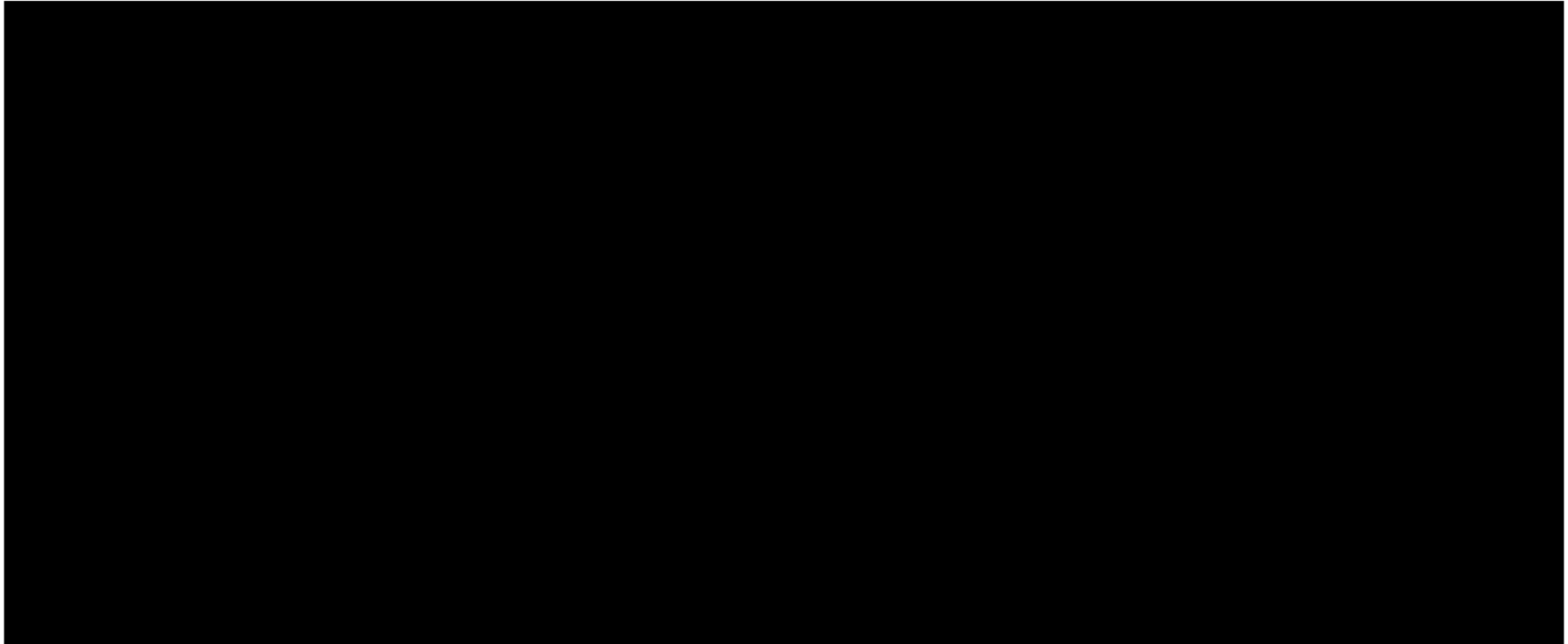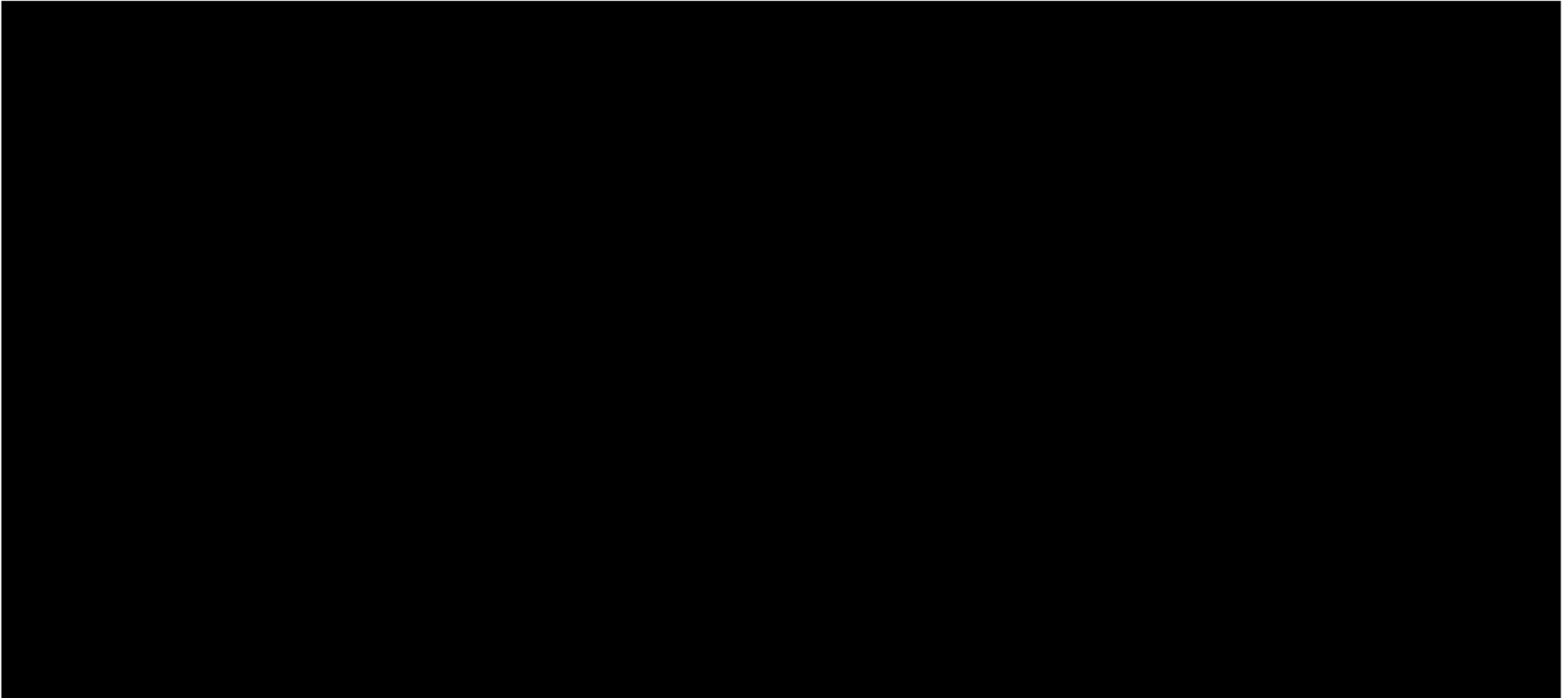
Exhibit 26d

Sources:
[1] Exhibit 26a.
[2] Exhibits 34e, 34h.

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Exhibit 27a

OkCupid's and Tinder's Damages During the Main and Alternative Damages Periods

Sensitivity Analysis #1: Correcting Dr. Schwartz's █████████████████

Sources:

[1] Exhibit 27c.

[2] Exhibits 34a, 34d, 34e, 34g.

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Exhibit 27b

OkCupid's and Tinder's Damages During 2022

Sensitivity Analysis #1: Correcting Dr. Schwartz's ███████ Adjustment
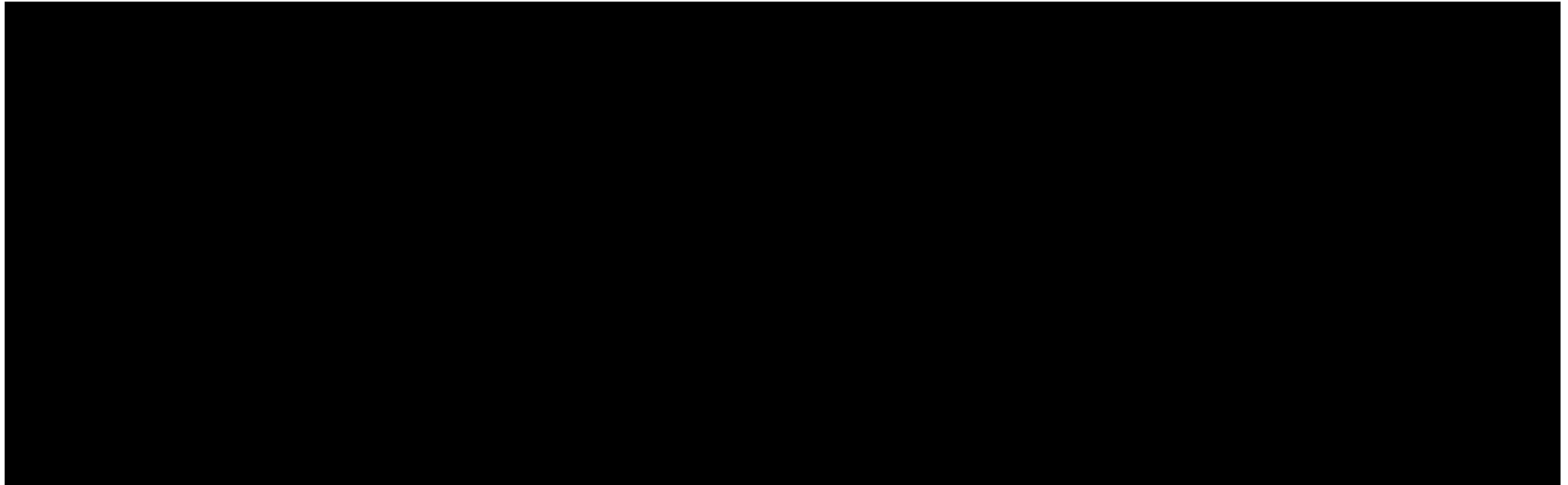
Sources:

[1] Exhibit 27d.

[2] Exhibits 34h, 34i.

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Exhibit 27c

Sources:

[1] GOOG-PLAY-004625919, tab ("data").
[2] GOOG-PLAY-001127244.
[3] Exhibit 34e.

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Exhibit 27d

Sources:
[1] Exhibit 27a.
[2] Exhibits 34e, 34h.

Expert Report of Dr. Gregory K. Leonard

Exhibit 28a

Sources:

[1] Exhibit 28c.

[2] Exhibits 34a, 34d, 34e, 34g.

Expert Report of Dr. Gregory K. Leonard

Exhibit 28b

Sources:

[1] Exhibit 28d.

[2] Exhibits 34h, 34i.

Expert Report of Dr. Gregory K. Leonard

Exhibit 28c

Sources:
[1] GOOG-PLAY-001127244.
[2] Exhibit 34e.

Expert Report of Dr. Gregory K. Leonard
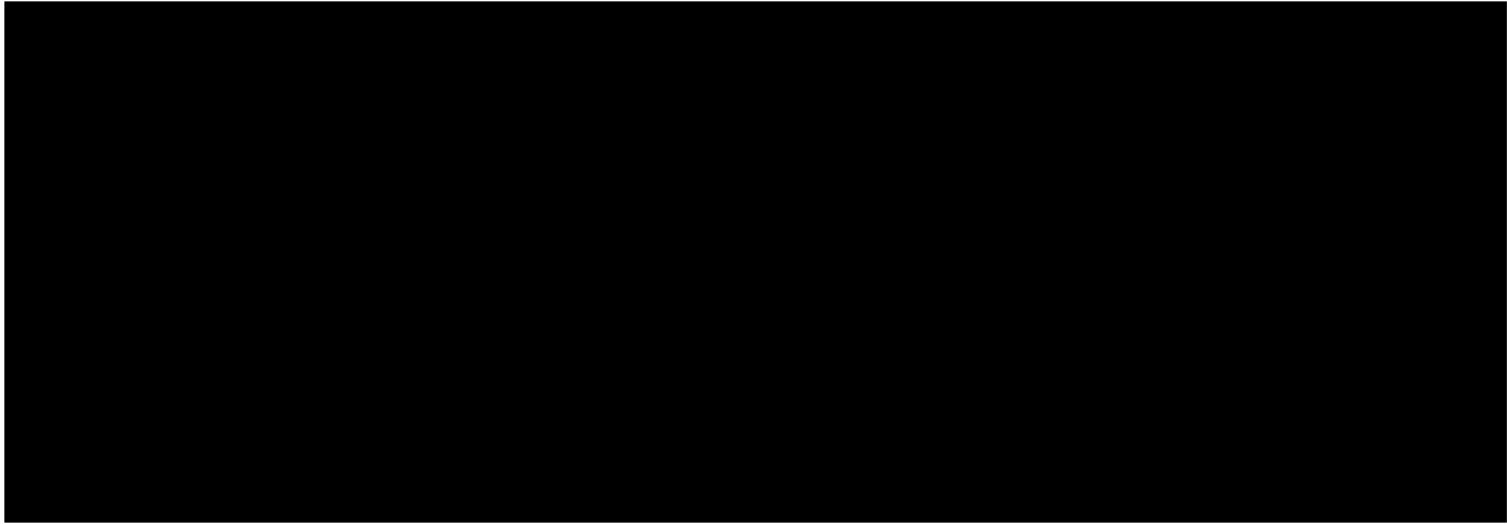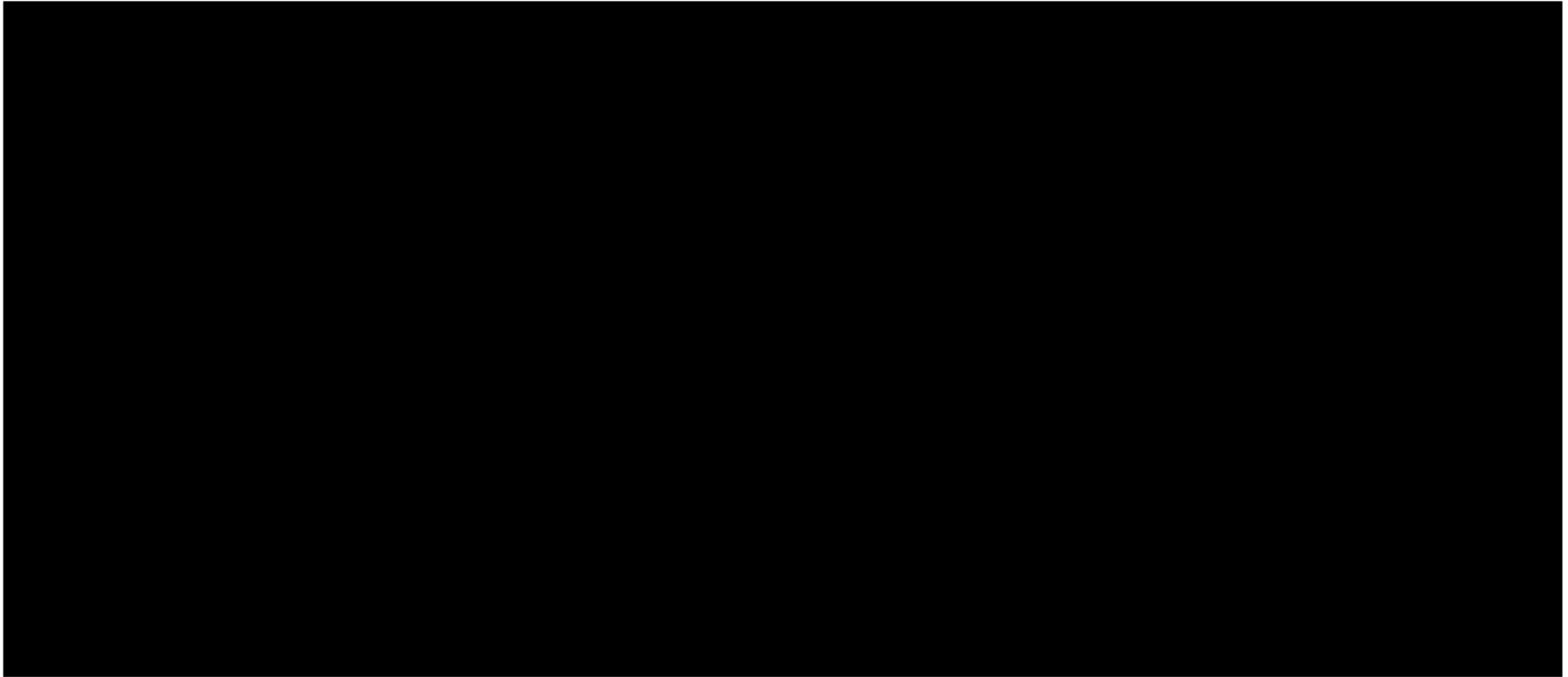
Exhibit 28d

Sources:
[1] Exhibit 28a.
[2] Exhibits 34e, 34h.

Expert Report of Dr. Gregory K. Leonard
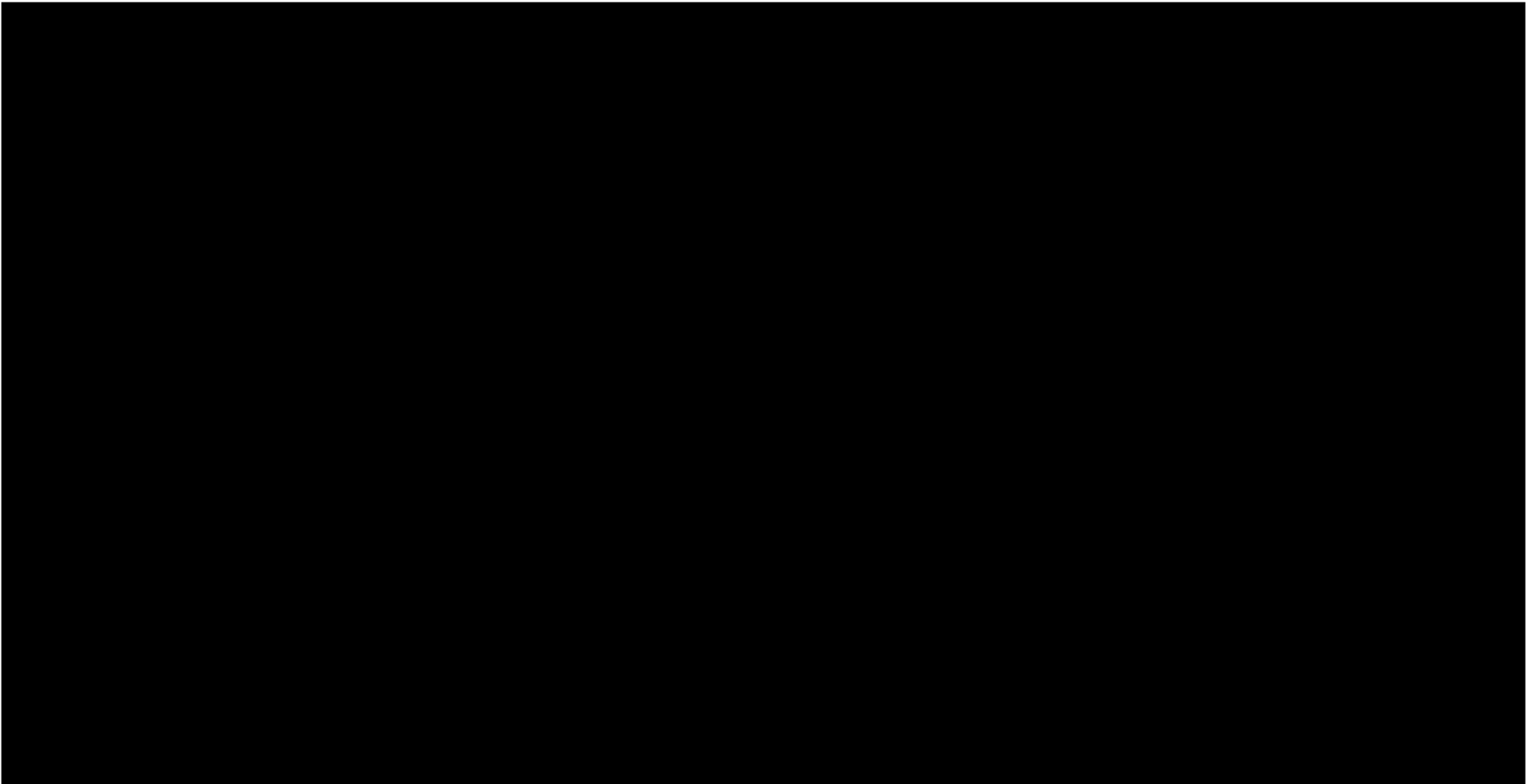
Exhibit 29a

Sources:

[1] Exhibit 29c.

[2] Exhibits 34a, 34d, 34e, 34g.

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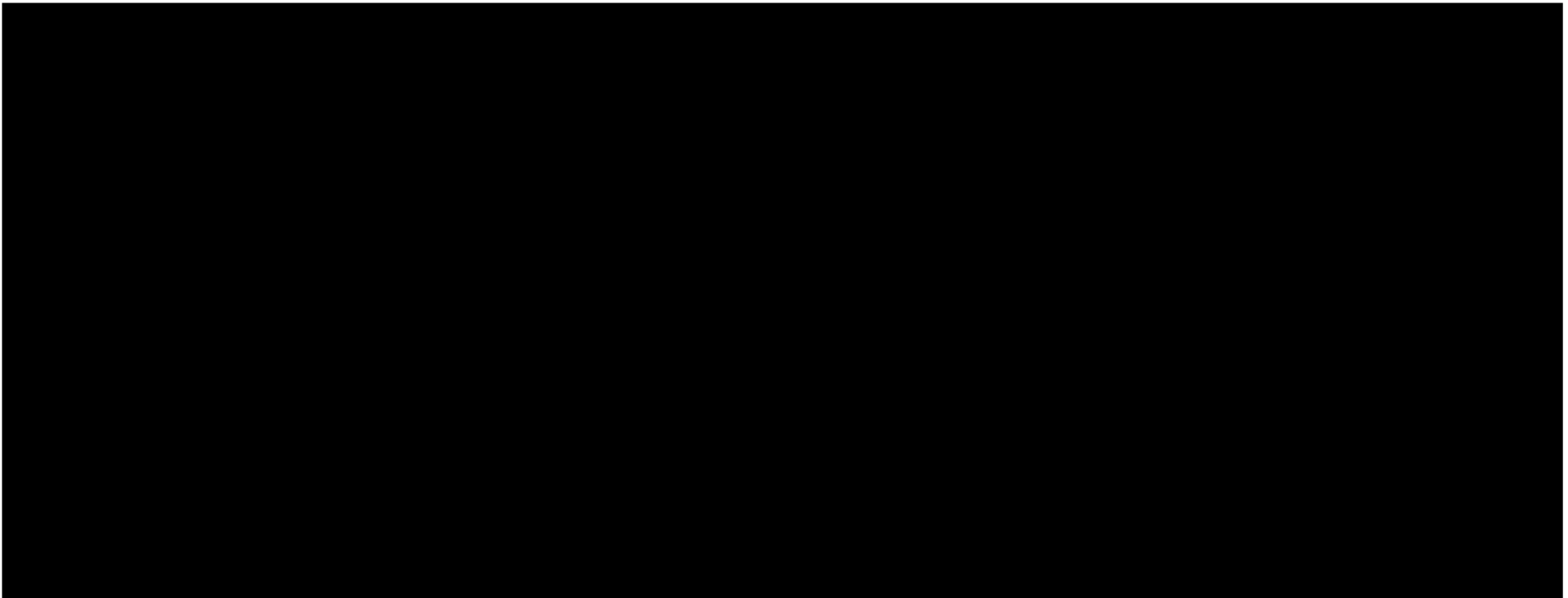
Exhibit 29b

Sources:

[1] Exhibit 29d.

[2] Exhibits 34h, 34i.
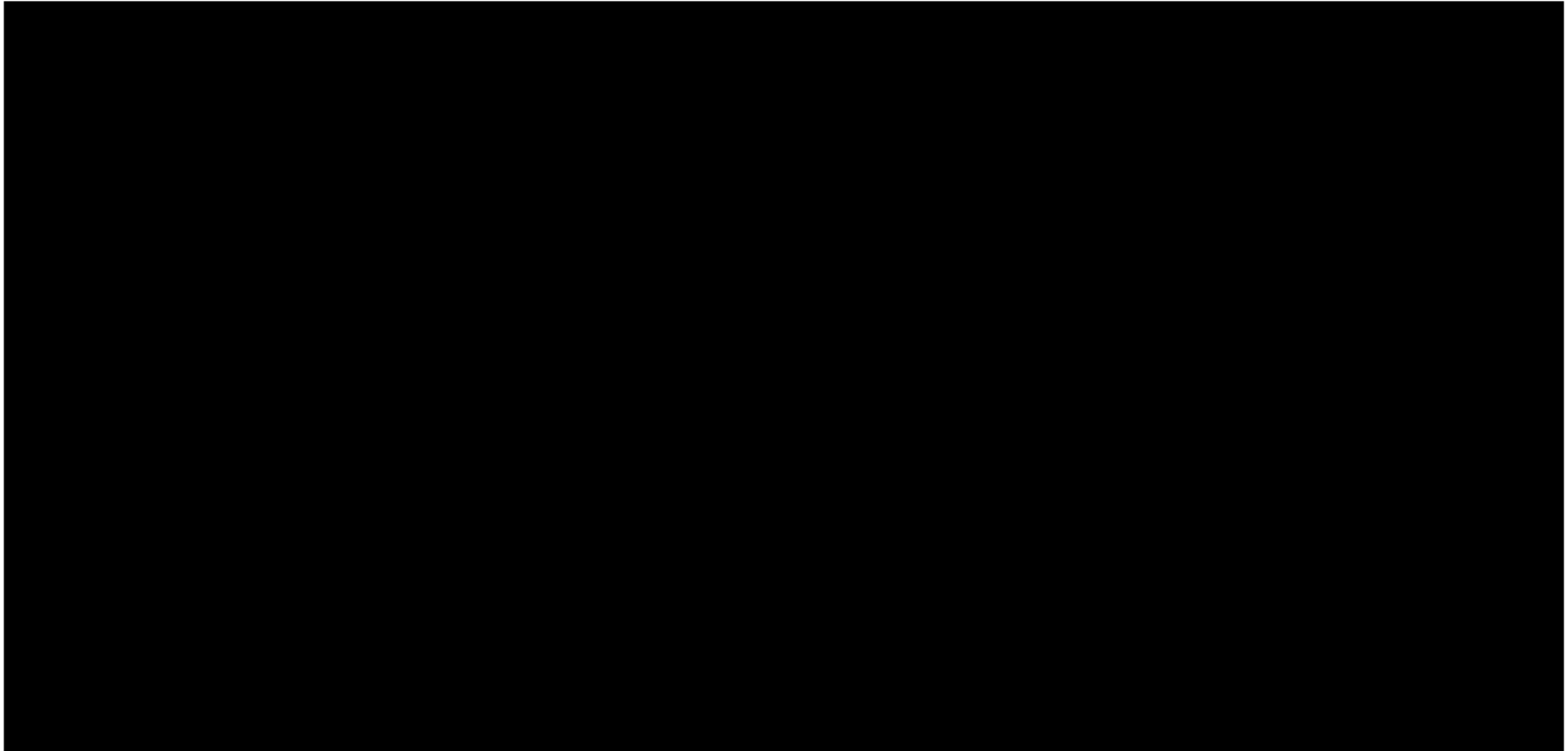
Expert Report of Dr. Gregory K. Leonard

Exhibit 29c

Sources:

[1] GOOG-PLAY-004625919, tab ("data").

[2] GOOG-PLAY-001127244.

[3] Exhibit 34e.

Expert Report of Dr. Gregory K. Leonard
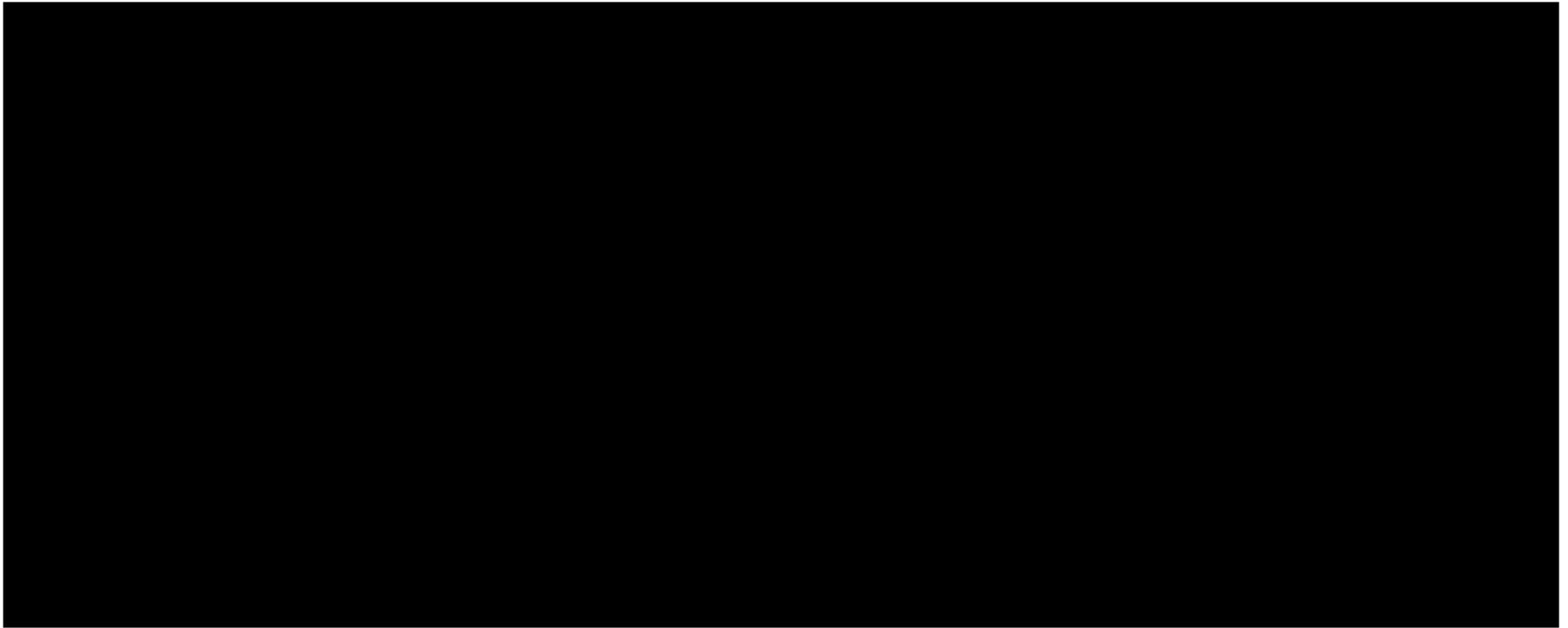
Exhibit 29d

Sources:
[1] Exhibit 29a.
[2] Exhibits 34e, 34h.

Expert Report of Dr. Gregory K. Leonard
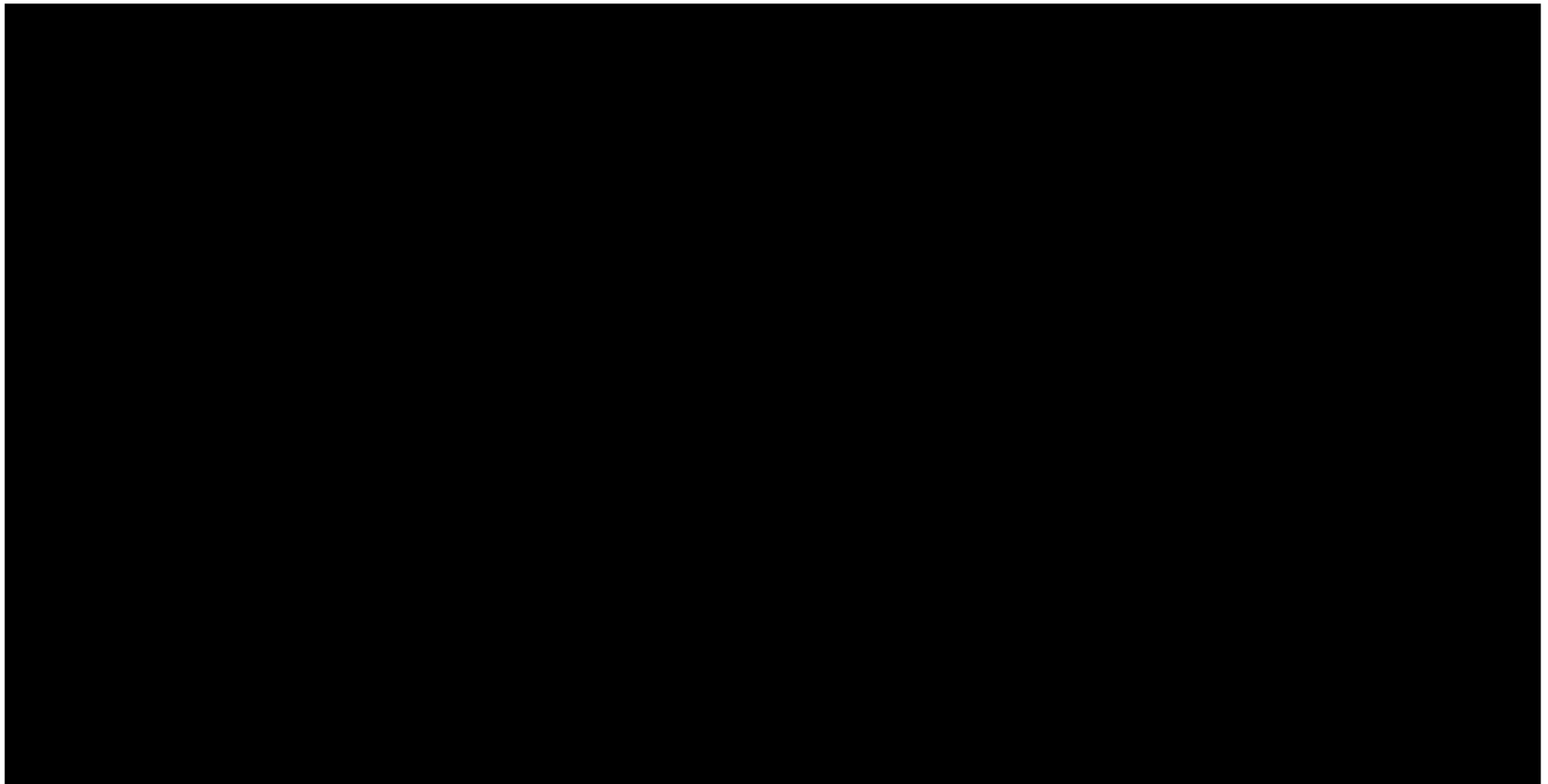
Exhibit 30a

Sources:

[1] Exhibit 30c.

[2] Exhibits 34a, 34d, 34e, 34g.

Expert Report of Dr. Gregory K. Leonard
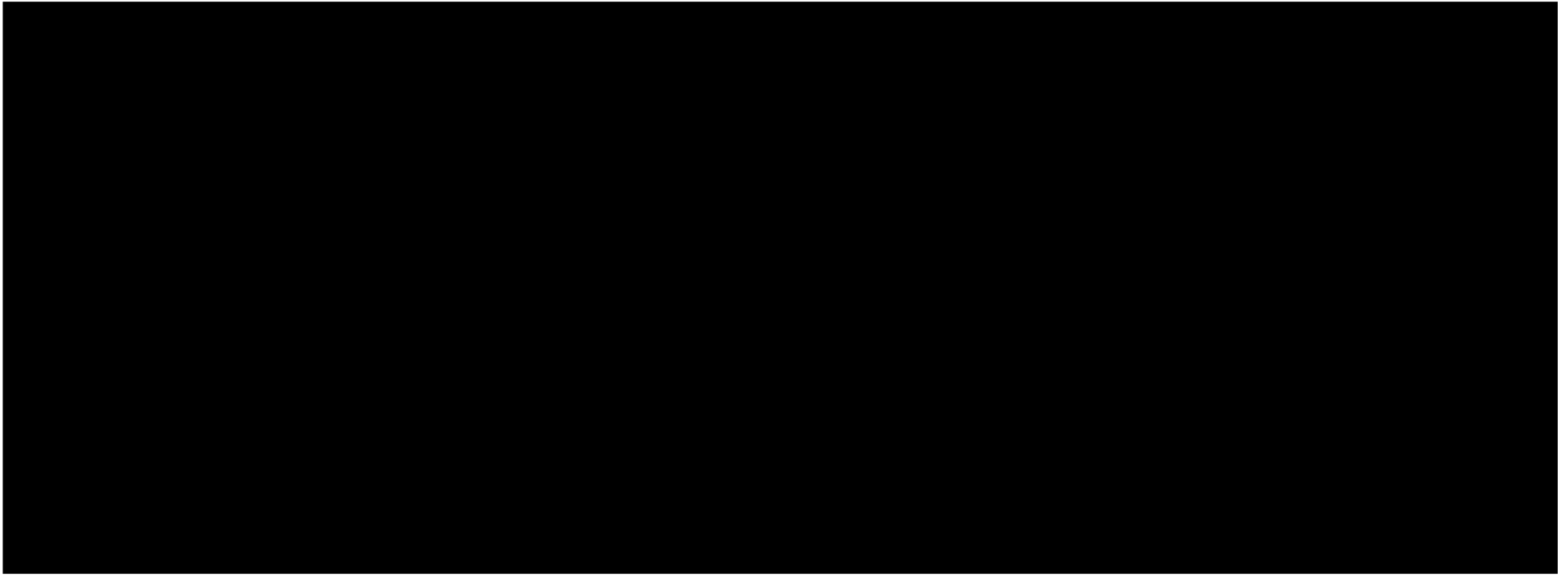
Exhibit 30b

Sources:

[1] Exhibit 30d.

[2] Exhibits 34h, 34i.

Expert Report of Dr. Gregory K. Leonard

Exhibit 30c

Sources:
[1] GOOG-PLAY-001127244.
[2] Exhibit 34e, 34g.

Expert Report of Dr. Gregory K. Leonard
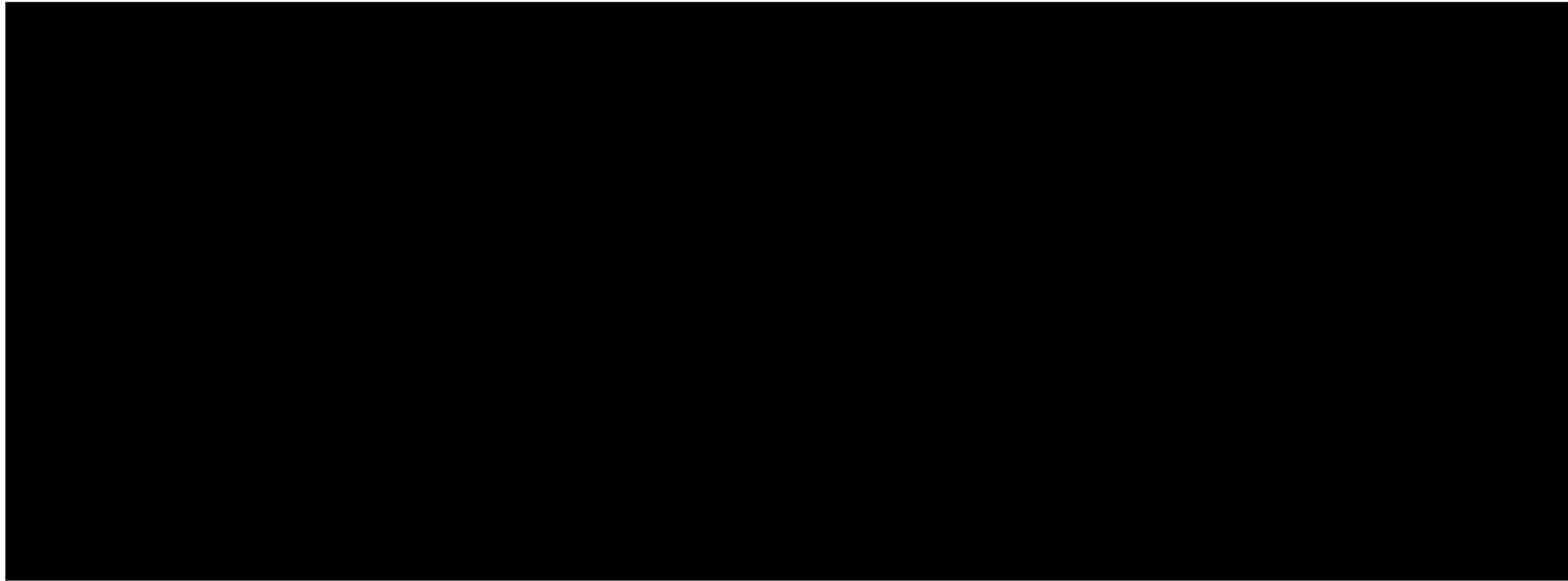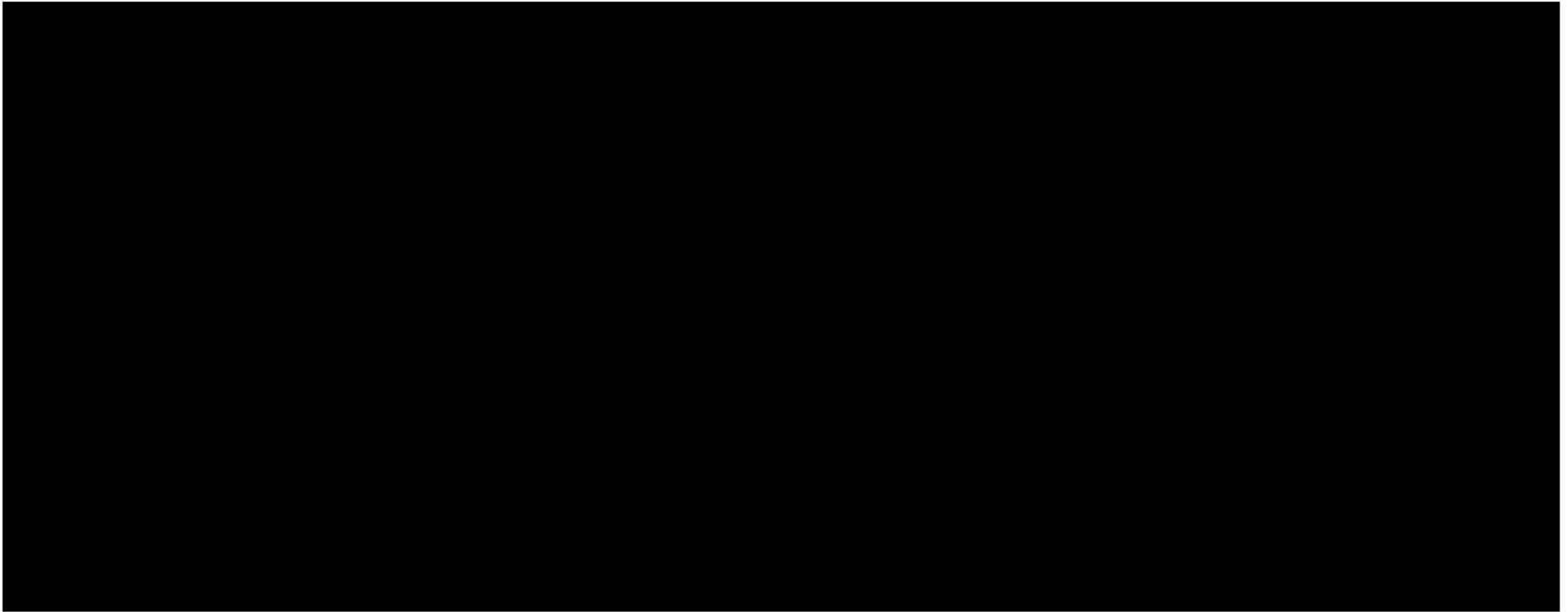
Exhibit 30d

Sources:
[1] Exhibit 30a.
[2] Exhibits 34e, 34h.

Expert Report of Dr. Gregory K. Leonard
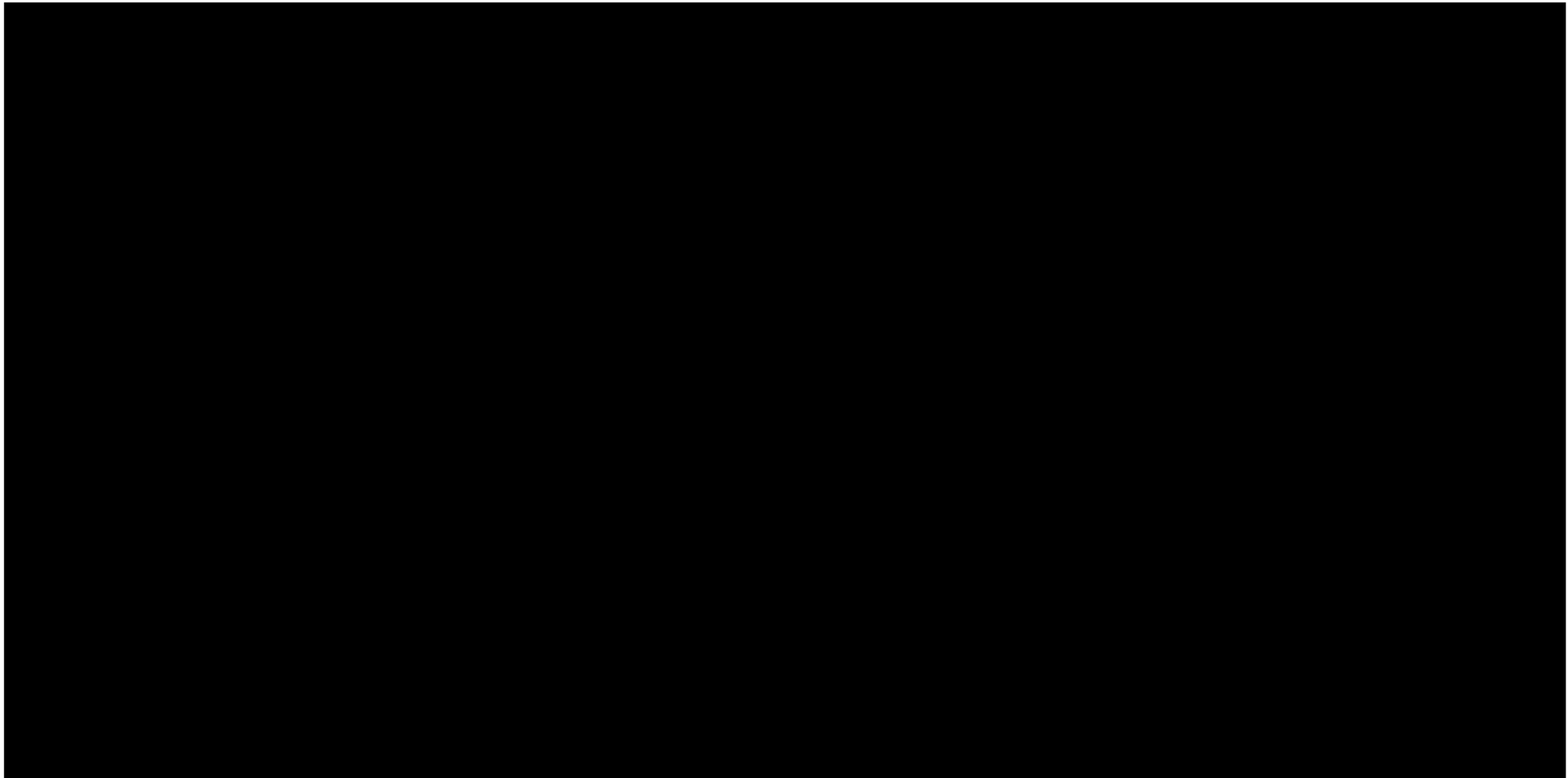
Exhibit 31a

Sources:

[1] Exhibit 31c.

[2] Exhibits 34a, 34d, 34e, 34g.

Expert Report of Dr. Gregory K. Leonard

Exhibit 31b

Sources:
[1] Exhibit 31d.
[2] Exhibits 34h, 34i.

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Exhibit 31c

Sources:
[1] GOOG-PLAY-004625919, tab ("data").
[2] Exhibits 34e.

Expert Report of Dr. Gregory K. Leonard
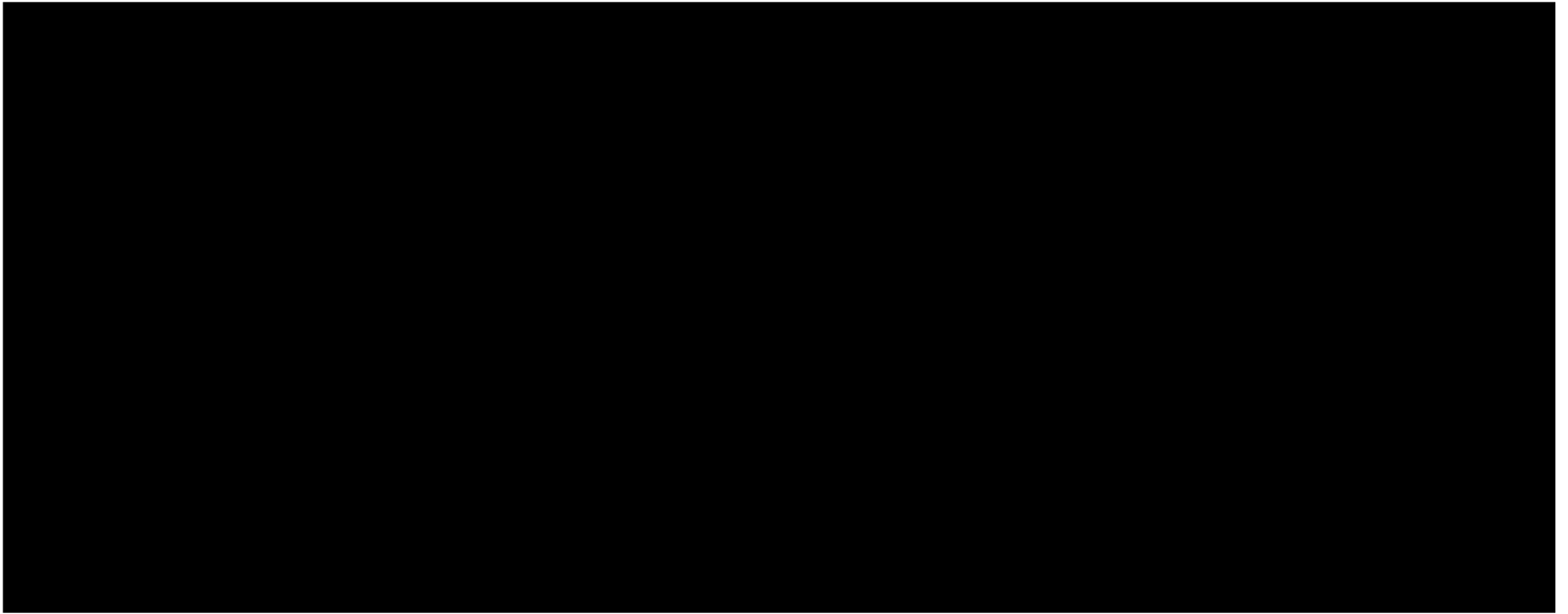
Exhibit 31d

Sources:
[1] Exhibit 31a.
[2] Exhibits 34e, 34h.

Expert Report of Dr. Gregory K. Leonard
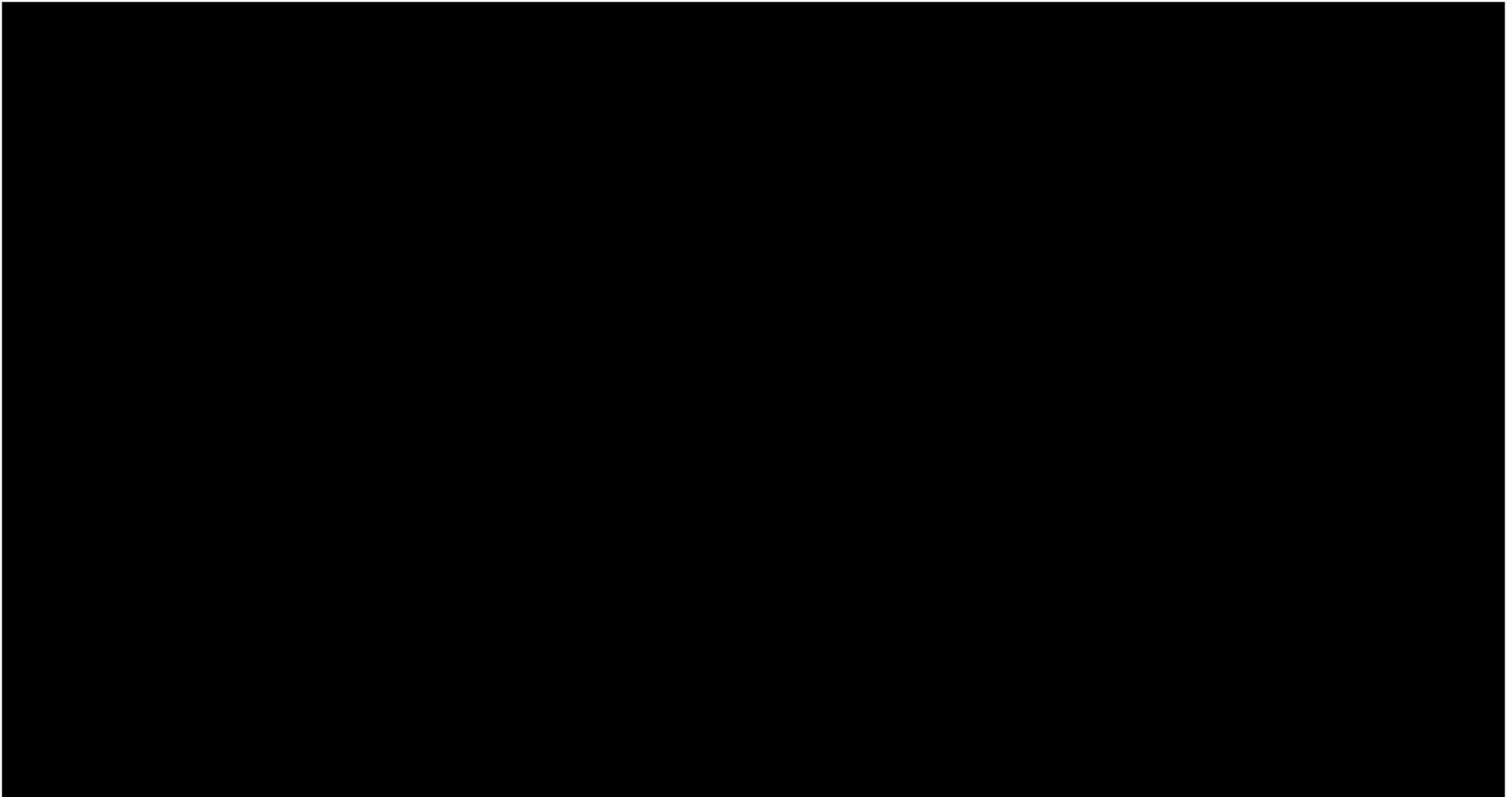
Exhibit 32a

Sources:

[1] Exhibit 32c.

[2] Exhibits 34a, 34d, 34e, 34g.

Expert Report of Dr. Gregory K. Leonard
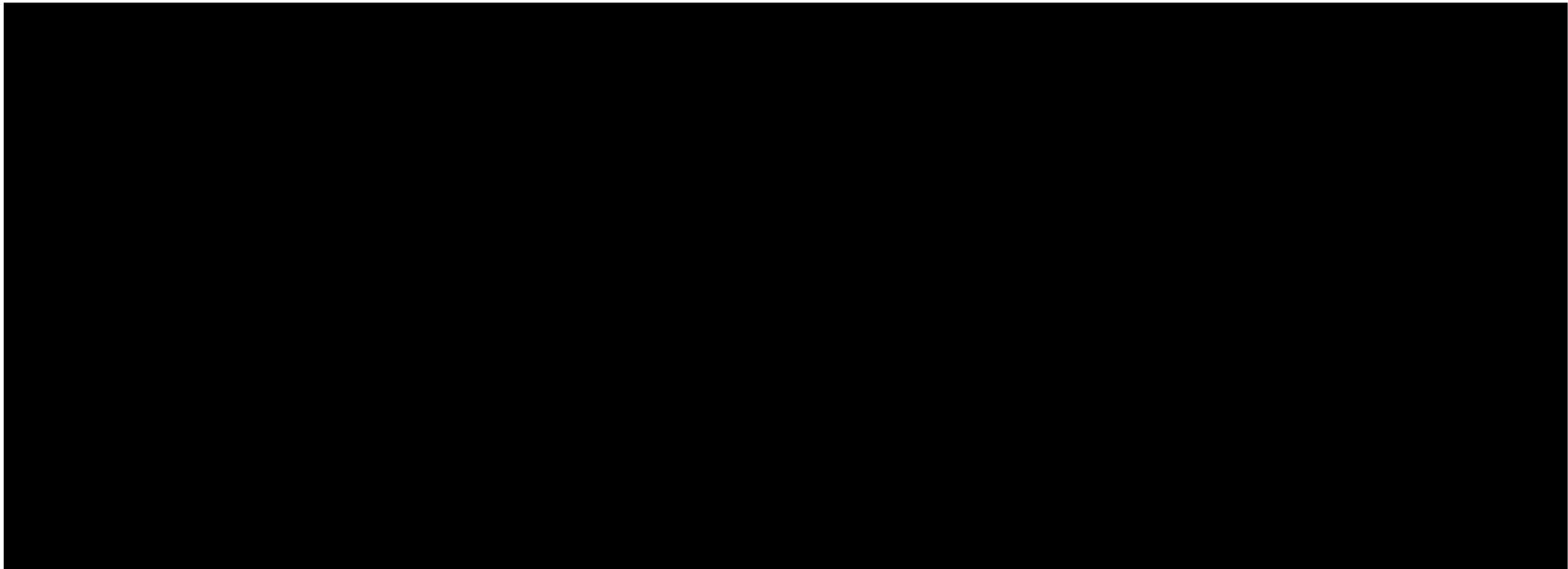
Exhibit 32b

Sources:
[1] Exhibit 32d.
[2] Exhibits 34h, 34i.

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Exhibit 32c

Sources:
[1] GOOG-PLAY-004625919, tab ("data").
[2] Exhibits 34e.

Expert Report of Dr. Gregory K. Leonard
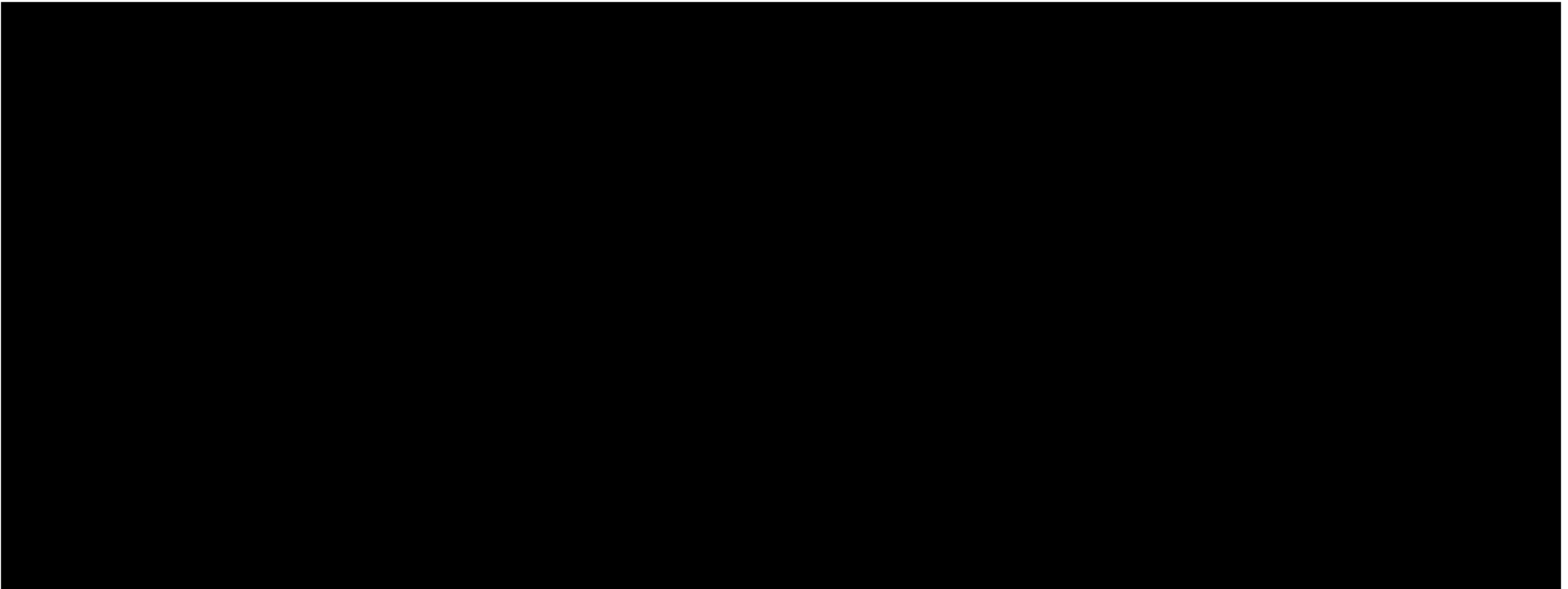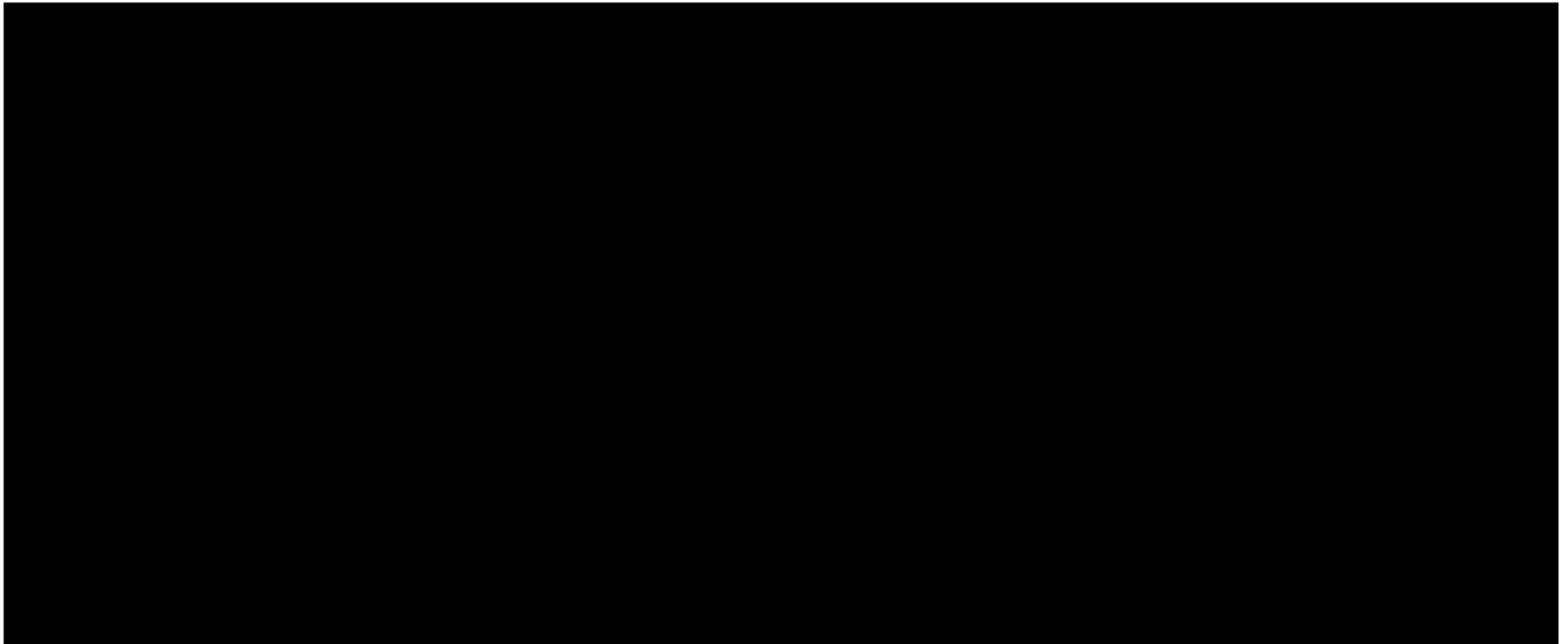
Exhibit 32d

Sources:
[1] Exhibit 32a.
[2] Exhibits 34e, 34h.

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Exhibit 33a

Total Damages for Match Plaintiffs' Apps

Using the Alternative Damages Model

	Main Damages Period	Alternative Damages Period	1/1/2022 — 5/20/2022
Overcharge Damages			
Adjusted Damages			

Notes:

[1] The overcharge damages are calculated as the difference between the actual service fees paid by Match Plaintiffs' apps and the but-for service fees incurred on Match Plaintiffs' apps' revenue processed through Google Play's billing system.

[2] The adjusted damages are calculated as the overcharge damages net of the but-for service fees incurred on Match Plaintiffs' apps' revenue processed through alternative billing systems.

Sources:

[1] Exhibits 33b-33d.

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Exhibit 33b

Total Damages for Match Plaintiffs' Apps

Using the Alternative Damages Model – During the Main Damages Period

	Subscriptions	In-App Purchases	Total
Revenue Processed through Google Play's Billing System	■	■	■
Actual Service Fees Paid			
But-For Service Fee Rate			
But-For Service Fees			
Overcharge Damages			
Revenue Processed through Alternative Billing Systems			
But-For Service Fee Rate			
But-For Service Fees			
Adjusted Damages			

Notes:

[1] The main damages period starts on July 7, 2017 and ends on December 31, 2021.

[2] OkCupid's financials do not contain data on Android service fees incurred from Google Play's billing system before May 2019. OkCupid's revenue processed through Google Play's billing system is assumed to have been subject to a 30% service fee rate in order to calculate the estimated service fees incurred from Google Play's billing system for months with missing service fees data.

[3] For Plenty of Fish's revenue processed through alternative billing systems, we apportion the monthly sales from "Web and Third-Party Android Payment Processor Direct Rev" based on the monthly Active user ratio of Website to Google Play Store.

[4] For Tinder's revenue processed through alternative billing systems, we subtract the revenue attributable to other app stores (Huawei App Gallery, Samsung Galaxy App Store, Xiaomi Mi Store, Oppo Store, HMS, and Vivo) from the Android revenue processed through alternative billing systems.

[5] The subscription revenue processed through Google Play's billing system is subject to a 15% but-for service fee rate.

[6] The first million in in-app purchases revenue processed through Google Play's billing system each year is subject to a 15% but-for service fee rate. The rest of the in-app purchases revenue processed through Google Play's billing system is subject to a 30% but-for service fee rate.

[7] The subscription and in-app purchases revenue processed through alternative billing systems are subject to 11% and 26% but-for service fee rates respectively.

Sources:

[1] MATCHGOOGLE00105742.

[2] MATCHGOOGLE00105770.

[3] MATCHGOOGLE00105797.

[4] MATCHGOOGLE00105815.

[5] MATCHGOOGLE00115561.

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Exhibit 33c

Total Damages for Match Plaintiffs' Apps

Using the Alternative Damages Model – During the Alternative Damages Period

	Subscriptions	In-App Purchases	Total
Revenue Processed through Google Play's Billing System	██	██	██
Actual Service Fees Paid	██	██	██
But-For Service Fee Rate	██	██	██
But-For Service Fees	██	██	██
Overcharge Damages	██	██	██
Revenue Processed through Alternative Billing Systems	██	██	██
But-For Service Fee Rate	██	██	██
But-For Service Fees	██	██	██
Adjusted Damages	██	██	██

Notes:

[1] The alternative damages period starts on May 9, 2018 and ends on December 31, 2021.

[2] OkCupid's financials do not contain data on Android service fees incurred from Google Play's billing system before May 2019. OkCupid's revenue processed through Google Play's billing system is assumed to have been subject to a 30% service fee rate in order to calculate the estimated service fees incurred from Google Play's billing system for months with missing service fees data.

[3] For Plenty of Fish's revenue processed through alternative billing systems, we apportion the monthly sales from "Web and Third-Party Android Payment Processor Direct Rev" based on the monthly Active user ratio of Website to Google Play Store.

[4] For Tinder's revenue processed through alternative billing systems, we subtract the revenue attributable to other app stores (Huawei App Gallery, Samsung Galaxy App Store, Xiaomi Mi Store, Oppo Store, HMS, and Vivo) from the Android revenue processed through alternative billing systems.

[5] The subscription revenue processed through Google Play's billing system is subject to a 15% but-for service fee rate.

[6] The first million in in-app purchases revenue processed through Google Play's billing system each year is subject to a 15% but-for service fee rate. The rest of the in-app purchases revenue processed through Google Play's billing system is subject to a 30% but-for service fee rate.

[7] The subscription and in-app purchases revenue processed through alternative billing systems are subject to 11% and 26% but-for service fee rates respectively.

Sources:

[1] MATCHGOOGLE00105742.
[2] MATCHGOOGLE00105770.
[3] MATCHGOOGLE00105797.
[4] MATCHGOOGLE00105815.
[5] MATCHGOOGLE00115561.

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Exhibit 33d

Total Damages for Match Plaintiffs' Apps

Using the Alternative Damages Model – For the Period from January 1, 2022 to September 30, 2022

	Subscriptions	In-App Purchases	Total
Overcharge Damages	-	-	$0
Revenue Processed through Alternative Billing Systems	███████	███████	███████
But-For Service Fee Rate	11%	26%	-
But-For Service Fees	███████	███████	███████
Adjusted Damages	-	-	███████

Notes:

[1] The service fee rates charged on revenue processed through Google Play's billing system since the start of 2022 match the but-for service fee rates. As a result, Match Plaintiffs' apps have not suffered any overcharge damages starting from January 1, 2022.

[2] Since Match Plaintiffs' apps' revenue data for the months of January through March are not available, the subscriptions and in-app purchases revenues for those months are estimated as being equal to the sum total of the monthly average revenues of 5 Match Plaintiffs' apps (Match, OkCupid, Plenty of Fish, OurTime, and Tinder) during 2021.

[3] The subscription and in-app purchases revenue processed through alternative billing systems are subject to 11% and 26% but-for service fee rates respectively.

Source:

[1] Exhibit 33e.

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Exhibit 33e

Monthly Revenue of Match Plaintiffs' Apps

Processed through Alternative Billing Systems in 2022

Month	Subscriptions	In-App Purchases	Total
January-22			
February-22			
March-22			
April-22			
May-22			
June-22			
July-22			
August-22			
September-22			
Total			

Notes:

[1] Since Match Plaintiffs' apps' revenue data for the months of January through March are not available, the subscriptions and in-app purchases revenues for those months are estimated as being equal to the sum total of the monthly average revenues of 5 Match Plaintiffs' apps (Match, OkCupid, Plenty of Fish, OurTime, and Tinder) during 2021.

[2] For Plenty of Fish's monthly average revenue during 2021, we apportion the monthly sales from "Web and Third-Party Android Payment Processor Direct Rev" based on the monthly Active user ratio of Website to Google Play Store.

[3] For Tinder's monthly average revenue during 2021, we subtract the revenue attributable to other app stores (Huawei App Gallery, Samsung Galaxy App Store, Xiaomi Mi Store, Oppo Store, HMS, and Vivo) from the Android revenue processed through alternative billing systems.

[4] Match's financials for the months of April 2022 through July 2022 do not contain revenue data for Plenty of Fish.

Sources:

[1] MATCHGOOGLE00105742.
[2] MATCHGOOGLE00105770.
[3] MATCHGOOGLE00105797.
[4] MATCHGOOGLE00105815.
[5] MATCHGOOGLE00106377.
[6] MATCHGOOGLE00106378.
[7] MATCHGOOGLE00106379.
[8] MATCHGOOGLE00106380.
[9] MATCHGOOGLE00115561.
[10] MATCHGOOGLE00115566.
[11] MATCHGOOGLE00119761.

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Exhibit 34a

OkCupid's and Tinder's Revenue Processed Through Google Play's Billing System
During the Main and Alternative Damages Periods

Damages Scenario	Application	Metric	2017	2018	2019	2020	2021	Total
Main Damages Period	OkCupid	Android Revenue Processed Through Google Play's Billing System Android Service Fees Incurred from Google Play's Billing System Estimated Transactions Processed Through Google Play's Billing System						
	Tinder	Android Revenue Processed Through Google Play's Billing System Android Service Fees Incurred from Google Play's Billing System Estimated Transactions Processed Through Google Play's Billing System						
Alternative Damages Period	OkCupid	Android Revenue Processed Through Google Play's Billing System Android Service Fees Incurred from Google Play's Billing System Estimated Transactions Processed Through Google Play's Billing System						
	Tinder	Android Revenue Processed Through Google Play's Billing System Android Service Fees Incurred from Google Play's Billing System Estimated Transactions Processed Through Google Play's Billing System						

Notes:

[1] The main damages period starts on July 7, 2017 and ends on December 31, 2021 The alternative damages period starts on May 9, 2018 and ends on December 31, 2021 For the main damages period calculations, the July 2017 revenue, service fees, and transaction counts are prorated on a daily basis For the alternative damages period calculations, the May 2018 revenue, service fees, and transaction counts are prorated on a daily basis

[2] OkCupid's financials do not contain data on Android service fees incurred from Google Play's billing system before May 2019 OkCupid's service fees incurred from Google Play's billing system through the period May 2019 to December 2021 are used to compute the average service fee rate over this period This average service fee rate is then multiplied by the Android revenue processed through Google Play's billing system in order to calculate the estimated service fees incurred from Google Play's billing system for months with missing service fees data

[3] The Google Play transaction data is used to calculate the estimated revenue per transaction for each month during the damages periods The Android revenue processed through Google Play's billing system is then divided by the estimated revenue per transaction to calculate the estimated transactions processed through Google Play's billing system

Sources:

[1] MATCHGOOGLE00105770
[2] MATCHGOOGLE00115561
[3] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260

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Exhibit 34b

Transaction Fees of Alternative Payment Processing Providers

2017 – 2021

Payment Processing Providers	Transaction Fee									
	2017		2018		2019		2020		2021	
	% of Revenue	Flat fee	% of Revenue	Flat fee	% of Revenue	Flat fee	% of Revenue	Flat fee	% of Revenue	Flat fee
Adyen	3.95%	$0.12	3.95%	$0.12	3.95%	$0.12	3.95%	$0.12	3.95%	$0.12
Amazon Pay	2.90%	$0.30	2.90%	$0.30	2.90%	$0.30	2.90%	$0.30	2.90%	$0.30
Authorize.net	2.90%	$0.30	2.90%	$0.30	2.90%	$0.30	2.90%	$0.30	2.90%	$0.30
Braintree	2.90%	$0.30	2.90%	$0.30	2.90%	$0.30	2.90%	$0.30	2.90%	$0.30
Clover	3.50%	$0.10	3.50%	$0.10	3.50%	$0.10	3.50%	$0.10	3.50%	$0.10
PayPal	2.90%	$0.30	2.90%	$0.30	2.90%	$0.30	2.70%	$0.30	2.70%	$0.30
Square	-	-	-	-	-	-	2.90%	$0.30	2.90%	$0.30
Stax	-	-	-	-	-	-	-	-	-	-
Stripe	2.90%	$0.30	2.90%	$0.30	2.90%	$0.30	2.90%	$0.30	2.90%	$0.30
Vanco	2.27%	$0.45	2.27%	$0.45	2.27%	$0.45	2.27%	$0.45	2.27%	$0.45
Chase	2.90%	$0.25	2.90%	$0.25	2.90%	$0.25	2.90%	$0.25	2.90%	$0.25

Source:

[1] Attachment C-2, Expert Report of Dr. Schwartz, October 3, 2022.

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Exhibit 34c

Tinder's Effective Service Fee Rate from Alternative Payment Processing Providers
During the Main Damages Period

Payment Processing Providers	Processing Fees						Revenue	Effective Rate
	2017	2018	2019	2020	2021	Total		
Adyen								
Amazon Pay								
Authorize net								
Braintree								
Clover								
PayPal								
Square								
Stax								
Stripe								
Vanco								
Chase								

Notes:

[1] The processing fees based on revenue are calculated by multipltying Tinder's Android revenue processed through Google Play's billing system with the payment processing provider's % transaction fee. The processing fees based on flat fee per transaction are calculated by multiplying Tinder's estimated transactions processed through Google Play's billing system with the payment providers' flat fee per transaction. The total processing fee for each year is then calculated by taking the sum of the processing fees based on revenue and the processing fees based on flat fee per transaction.

[2] Tinder's effective service fee rate is calculated by dividing the total processing fees over the main damages period by Tinder's total Android revenue processed through Google Play's billing system during that period.

Sources:

[1] Exhibits 34a-34b.

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Exhibit 34d

OkCupid's and Tinder's But-For Form of Payment Fees
During the Main and Alternative Damages Periods

Damages Scenario	Application	Android Revenue Processed through Google Play's Billing System	But-For Form of Payment Rate	But-For Form of Payment Fees
Main Damages Period Base Case	OkCupid			
	Tinder			
	Total			
Main Damages Period High Rate	OkCupid			
	Tinder			
	Total			
Alternative Damages Period Base Case	OkCupid			
	Tinder			
	Total			
Alternative Damages Period High Rate	OkCupid			
	Tinder			
	Total			

Notes:

[1] The main damages period starts on July 7, 2017 and ends on December 31, 2021. The alternative damages period starts on May 9, 2018 and ends on December 31, 2021.

[2] The Base Case scenario uses OkCupid's and Tinder's historic rate from their own payment processing systems, ███ and ███ respectively, to compute the but-for Form of Payment fees.

[3] The High Rate scenario uses the most common effective rates of alternative payment processing providers for Tinder ███) to compute the but-for Form of Payment fees.

Sources:

[1] Attachment C-4, Expert Report of Dr. Schwartz, October 3, 2022.

[2] Exhibits 34a, 34c.

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Exhibit 34e

OkCupid's and Tinder's Revenue Adjusted Play Installs
During the Main Damages Period

Application	Metric	2017	2018 Q1 –	2019 Q2 –	2020	2021	Total
OkCupid	Android Revenue when App was Downloaded from Play Android Application Installs via Play Revenue Per Install Revenue Per Install Adjustment Factor Android Application Installs via Play – Adjusted for Revenue Per Install						
Tinder	Android Revenue when App was Downloaded from Play Android Application Installs via Play Revenue Per Install Revenue Per Install Adjustment Factor Android Application Installs via Play – Adjusted for Revenue Per Install						

Notes:

[1] The main damages period starts on July 7, 2017 and ends on December 31, 2021. For the main damages period calculations, the July 2017 revenue and install counts are prorated on a daily basis.

[2] Android revenue when app was downloaded from Play is calculated by adding the Android revenue processed through Google Play's billing system and the Android revenue processed through alternative billing systems. For Tinder's revenue calculation, we subtract the revenue attributable to other app stores (Huawei App Gallery, Samsung Galaxy App Store, Xiaomi Mi Store, Oppo Store, HMS, and Vivo) from the Android revenue processed through alternative billing systems.

[3] The revenue per install adjustment factor for a particular period is calculated by dividing the revenue per install during that period by the revenue per install during the 2018 Q1 – 2019 Q1 period.

[4] The revenue adjusted Android application installs via Play are calculated by multiplying the actual Android application installs via Play with the revenue per install adjustment factor.

Sources:

[1] MATCHGOOGLE00105770.

[2] MATCHGOOGLE00115561.

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OkCupid's and Tinder's Revenue Adjusted Play Installs

During the Alternative Damages Period

Application	Metric	2018	2019	2020	2021	Total
OkCupid	Android Revenue when App was Downloaded from Play Android Application Installs via Play Revenue Per Install Revenue Per Install Adjustment Factor Android Application Installs via Play – Adjusted for Revenue Per Install					
Tinder	Android Revenue when App was Downloaded from Play Android Application Installs via Play Revenue Per Install Revenue Per Install Adjustment Factor Android Application Installs via Play – Adjusted for Revenue Per Install					

Notes:

[1] The alternative damages period starts on May 9, 2018 and ends on December 31, 2021. For the alternative damages period calculations, the May 2018 revenue and install counts are prorated on a daily basis.

[2] Android revenue when app was downloaded from Play is calculated by adding the Android revenue processed through Google Play's billing system and the Android revenue processed through alternative billing systems. For Tinder's revenue calculation, we subtract the revenue attributable to other app stores (Huawei App Gallery, Samsung Galaxy App Store, Xiaomi Mi Store, Oppo Store, HMS, and Vivo) from the Android revenue processed through alternative billing systems.

[3] The revenue per install adjustment factor for a particular period is calculated by dividing the revenue per install during that period by the revenue per install during the 2018 Q1 – 2019 Q1 period calculated in Exhibit 10e.

[4] The revenue adjusted Android application installs via Play are calculated by multiplying the actual Android application installs via Play with the revenue per install adjustment factor.

Sources:

[1] MATCHGOOGLE00105770.

[2] MATCHGOOGLE00115561.

[3] Exhibit 34e.

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Exhibit 34g

█████████████████████████

During the Main and Alternative Damages Periods

Damages Scenario	Metric	Scenario 1		Scenario 2	
		OkCupid	Tinder	OkCupid	Tinder
Main Damages Period	███████████████ Total Play Application Installments (2018 Q1 – 2019 Q1) ██████████████ Total Installments During Damages Period ████████████████	████████	████████	████████	████████
Alternative Damages Period	███████████████ Total Play Application Installments (2018 Q1 – 2019 Q1) ██████████████ Total Installments During Damages Period ████████████████				

Notes:
[1] ██
██
████████████████████████████
██████████████████████████████████████
██
██████████████████████████████

Sources:
[1] MATCHGOOGLE00105770.
[2] MATCHGOOGLE00115561.
[3] GOOG-PLAY-004625919, tab ("data").
[4] GOOG-PLAY-011274244.

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Exhibit 34h

OkCupid's and Tinder's Estimated 2022 Android Revenue

Using Google Play Transactions Data

Metric	OkCupid	Tinder
Global Revenue Processed Through Google Play's Billing System (2021)		
U.S. Revenue Processed Through Google Play's Billing System (2021)		
Percent of Global Revenue Processed Through Google Play's Billing System Earned in the U.S.		
Global Service Fees Incurred From Google Play's Billing System (2021)		
U.S. Service Fees Incurred From Google Play's Billing System (2021)		
Percent of Global Service Fees Accrued in the U.S.		
Android Application Revenue when App was Downloaded from Play (2021)		
U.S. Revenue Processed Through Google Play's Billing System as a Percent of Android Application Revenue when App was Downloaded from Play		
1/1/2022 – 5/20/2022 U.S. Revenue Processed Through Google Play's Billing System		
1/1/2022 – 5/20/2022 Global Revenue Processed Through Google Play's Billing System		
1/1/2022 – 5/20/2022 U.S. Service Fees Incurred From Google Play's Billing System		
1/1/2022 – 5/20/2022 Global Service Fees Incurred From Google Play's Billing System		
1/1/2022 – 5/20/2022 Android Application Revenue when App was Downloaded from Play		

Notes:

[1] The U.S. revenue and service fees from Google Play transactions data for the 2022 damages period are used to estimate the global revenue and service fees for OkCupid and Tinder based on the ratio of U.S. to Global revenues and service fees respectively for 2021.

Sources:

[1] MATCHGOOGLE00105770.

[2] MATCHGOOGLE00115561.

[3] Google Play transactions data: GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 34i

OkCupid's and Tinder's But-For Form of Payment Fees
During the 2022 Damages Period

Damages Scenario	Application	Android Revenue Processed through Google Play's Billing System	But-For Form of Payment Rate	But-For Form of Payment Fees
1/1/2022 – 5/20/2022 Base Case	OkCupid			
	Tinder			
	Total			
1/1/2022 – 5/20/2022 High Rate	OkCupid			
	Tinder			
	Total			

Notes:

[1] The Base Case scenario uses OkCupid's and Tinder's historic rate from their own payment processing systems, ▮ and ▮ respectively, to compute the but-for Form of Payment fees.

[2] The High Rate scenario uses the most common effective rates of alternative payment processing providers for Tinder (▮) to compute the but-for Form of Payment fees.

Sources:

[1] Attachment C-4, Expert Report of Dr. Schwartz, October 3, 2022.

[2] Exhibits 34c, 34h.

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Exhibit C1

Pass-Through Rate Estimation

Time Period: July 2020 - June 2021

Placebo Test

	IAPs	Paid Downloads	Subscriptions
Pass-Through Rate	███████	███████	███████
P-Value	0.68	0.62	0.88
Number of Treated SKUs	16,047	3,113	2,874
Number of Control SKUs	11,507	1,404	3,295
Number of SKU-Month Obs.	330,648	54,204	74,028

Notes:

[1] The sample includes the treated SKUs subject to a 29.5%-30.5% service fee rate in the pre period (from July 2020 to June 2021) and 14.5%-15.5% in the post period (from July 2021 to May 2022), and the control SKUs subject to a 29.5%-30.5% service fee rate throughout July 2020 and May 2022.

[2] The sample is "balanced" by restricting to include only SKUs with non-zero sales in every month betweeen July 2020 and May 2022.

[3] A placebo sample is created by truncating the sample in June 2021, before the real intervention took place, and starting artificial treatment in March 2021. The analysis period becomes July 2020 to June 2021.

[4] A low p-value (<= 0.05) indicates that the regression estimate is statistically significant, i.e., one can reject the null hypothesis that the regression estimate is zero; a high p-value (> 0.05) indicates that the regression estimate is not statistically significant, i.e., one cannot reject the null hypothesis that the regression estimate is zero.

Source:

[1] Google Play transaction data; GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit C2

Pass-Through Rate Estimation

Time Period: July 2020 - May 2022

Limiting SKUs to Those Accounting for 99% of Spend

	IAPs	Paid Downloads
Pass-Through Rate	██████████	██████████
P-Value	0.29	0.99
Number of Treated SKUs	7,154	3,036
Number of Control SKUs	7,962	1,340
Number of SKU-Month Obs.	347,668	100,648

Notes:

[1] The smallest SKUs jointly contributing to less than 1% revenue in each sample are dropped.

[2] The sample includes the treated SKUs subject to a 29.5%-30.5% service fee rate in the pre period (from July 2020 to June 2021) and 14.5%-15.5% in the post period (from July 2021 to May 2022), and the control SKUs subject to a 29.5%-30.5% service fee rate throughout July 2020 and May 2022.

[3] The sample is "balanced" by restricting to include only SKUs with non-zero sales in every month betweeen July 2020 and May 2022.

[4] A low p-value (≤ 0.05) indicates that the regression estimate is statistically significant, i.e., one can reject the null hypothesis that the regression estimate is zero; a high p-value (> 0.05) indicates that the regression estimate is not statistically significant, i.e., one cannot reject the null hypothesis that the regression estimate is zero.

Source:

[1] Google Play transaction data; GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit C3

Pass-Through Rate Estimation

Time Period: July 2020 - December 2021

Shortened Treatment Period

	IAPs	Paid Downloads
Pass-Through Rate	███████████	███████████
P-Value	0.56	0.94
Number of Treated SKUs	16,047	3,113
Number of Control SKUs	11,507	1,404
Number of SKU-Month Obs.	495,972	81,306

Notes:

[1] The sample includes the treated SKUs subject to a 29.5%-30.5% service fee rate in the pre period (from July 2020 to June 2021) and 14.5%-15.5% in the post period (from July 2021 to May 2022), and the control SKUs subject to a 29.5%-30.5% service fee rate throughout July 2020 and May 2022.

[2] The sample is "balanced" by restricting to include only SKUs with non-zero sales in every month betweeen July 2020 and May 2022.

[3] The treatment period is defined as July 2021 and December 2021.

[4] A low p-value (<= 0.05) indicates that the regression estimate is statistically significant, i.e., one can reject the null hypothesis that the regression estimate is zero; a high p-value (> 0.05) indicates that the regression estimate is not statistically significant, i.e., one cannot reject the null hypothesis that the regression estimate is zero.

Source:

[1] Google Play transaction data; GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

Exhibit C4

Pass-Through Rate Estimation

Time Period: July 2020 - May 2022

Limiting SKUs to Those in App Categories with a Low Treatment Group Revenue Share

	IAPs	Paid Downloads
Pass-Through Rate	███████	███████
P-Value	0.58	0.99
Number of Treated SKUs	8,663	318
Number of Control SKUs	8,535	116
Number of SKU-Month Obs.	395,554	9,982

Notes:

[1] The sample includes the treated SKUs subject to a 29.5%-30.5% service fee rate in the pre period (from July 2020 to June 2021) and 14.5%-15.5% in the post period (from July 2021 to May 2022), and the control SKUs subject to a 29.5%-30.5% service fee rate throughout July 2020 and May 2022.

[2] The sample is "balanced" by restricting to include only SKUs with non-zero sales in every month betweeen July 2020 and May 2022.

[3] The sample is further filtered based on the share of pre-period final consumer spend from the treatment group for each app category. For IAPs, if the treatment group's revenue share in a given app category is equal to or greater than 10%, then SKUs in that app category are dropped. For paid apps, the threshold is 40%.

[4] A low p-value (≤ 0.05) indicates that the regression estimate is statistically significant, i.e., one can reject the null hypothesis that the regression estimate is zero; a high p-value (> 0.05) indicates that the regression estimate is not statistically significant, i.e., one cannot reject the null hypothesis that the regression estimate is zero.

Source:

[1] Google Play transaction data; GOOG-PLAY-007203251; GOOG-PLAY3-000018260.

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Exhibit 35a

Average Monthly Product Price and Service Fee Rate for the Top 100 Paid Apps

With A Flat Service Fee Rate Reduction of 15 Percentage Points After July 2021

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 1.
[2] Price change before and after July 2021: no change in list price, no change in net price.
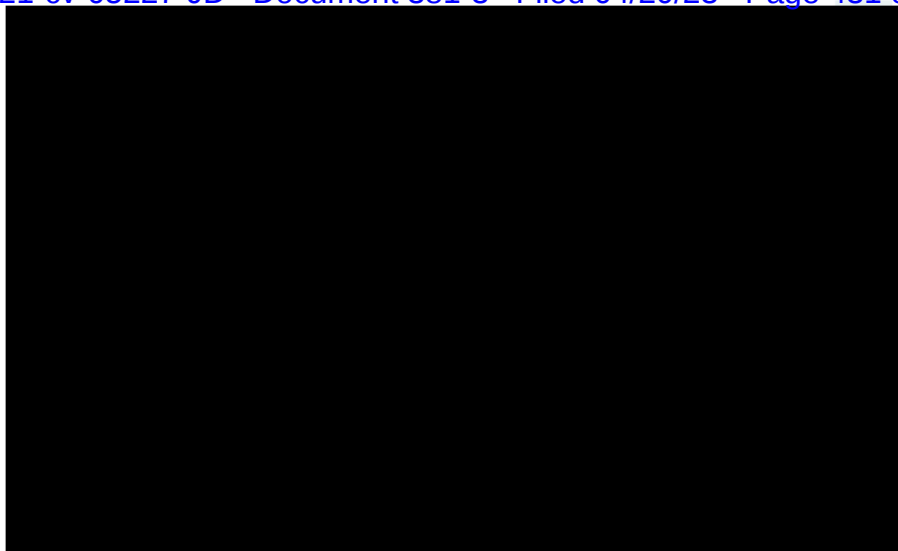[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 2.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
82% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 3.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 4.
[2] Price change before and after July 2021: no change in list price, no change in net price.
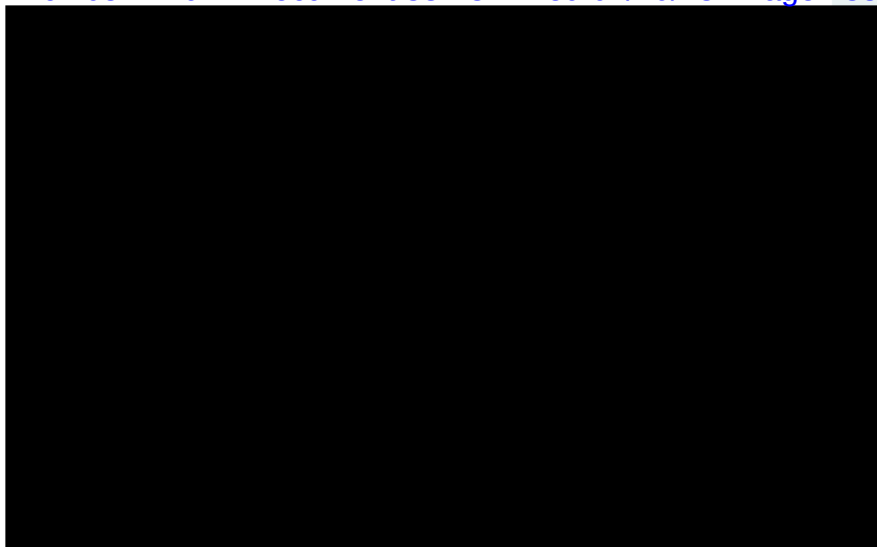[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
95% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 6.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 62% (for the corresponding app category);
80% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 11.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 95% (for the corresponding app category);
82% (for the corresponding app developer).

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[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 13.
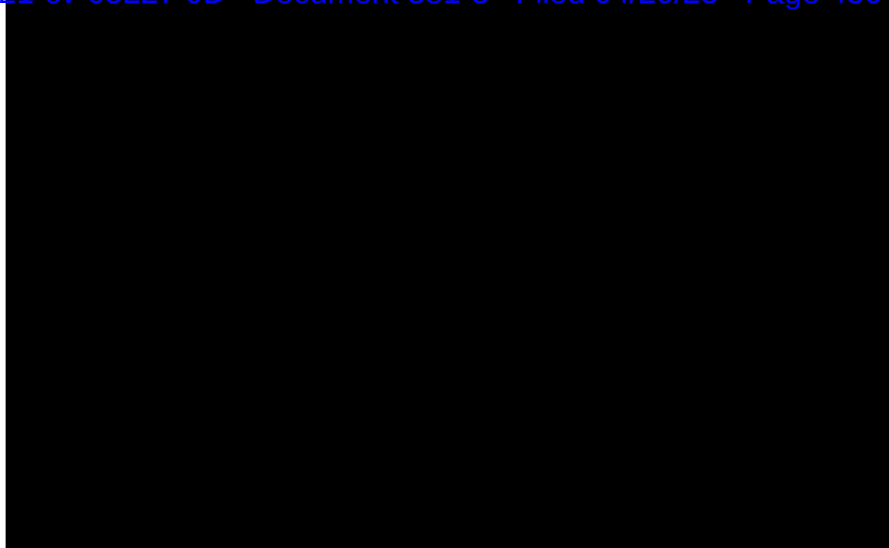[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
87% (for the corresponding app developer).

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[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 15.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
53% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 18.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
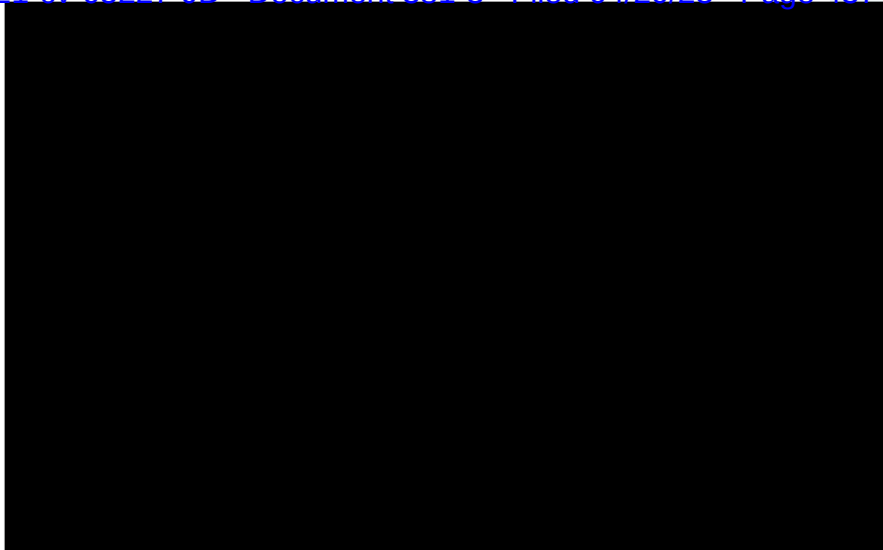98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 20.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
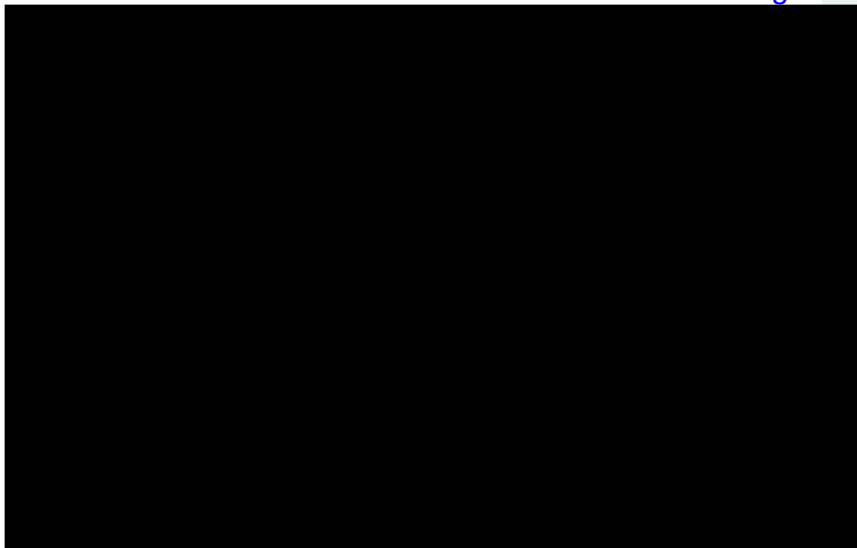100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 21.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 93% (for the corresponding app category);
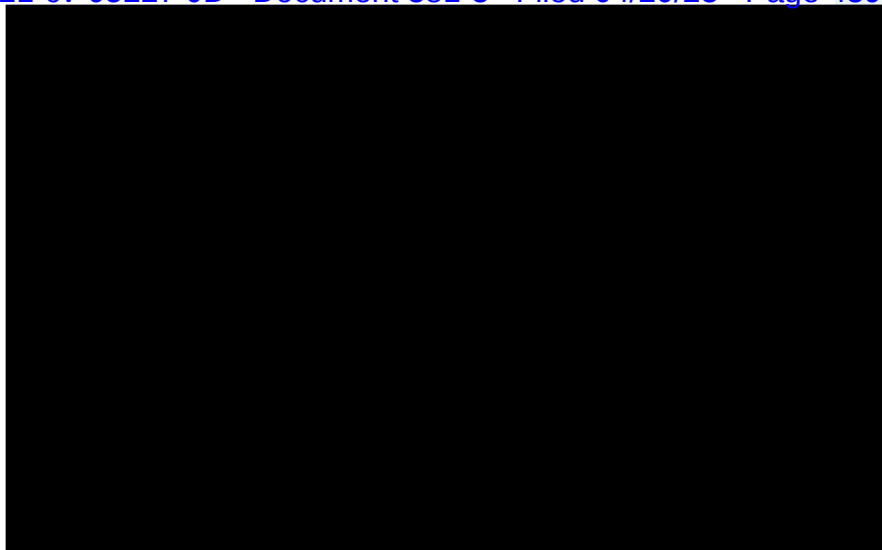88% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 25.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 26.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 96% (for the corresponding app developer).

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[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 27.
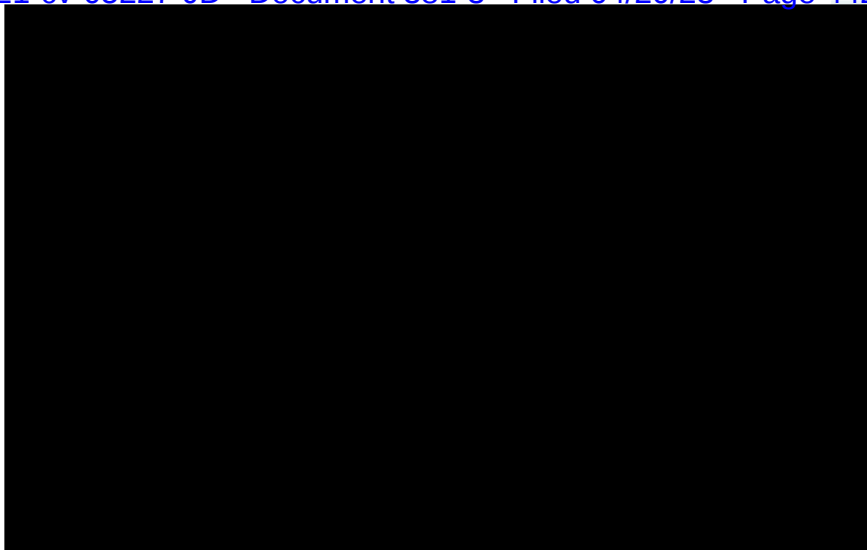[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 29.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 79% (for the corresponding app category);
93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 32.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
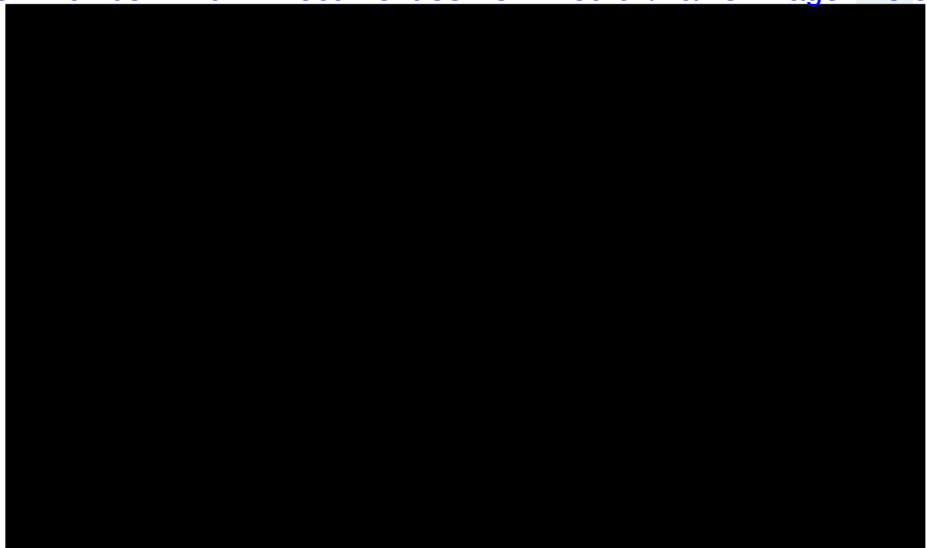97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 35.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category); 95% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 38.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 82% (for the corresponding app category);
89% (for the corresponding app developer).

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[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 43.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
95% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 47.
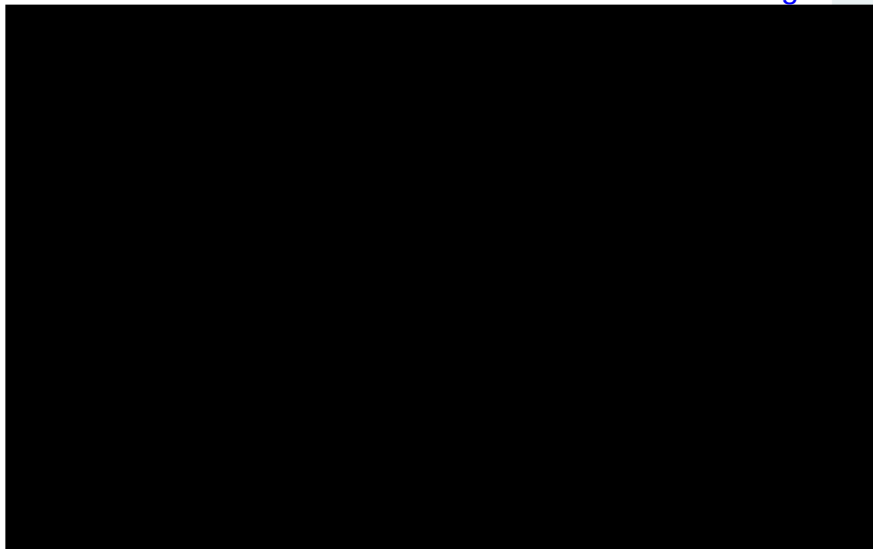[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
99% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 51.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
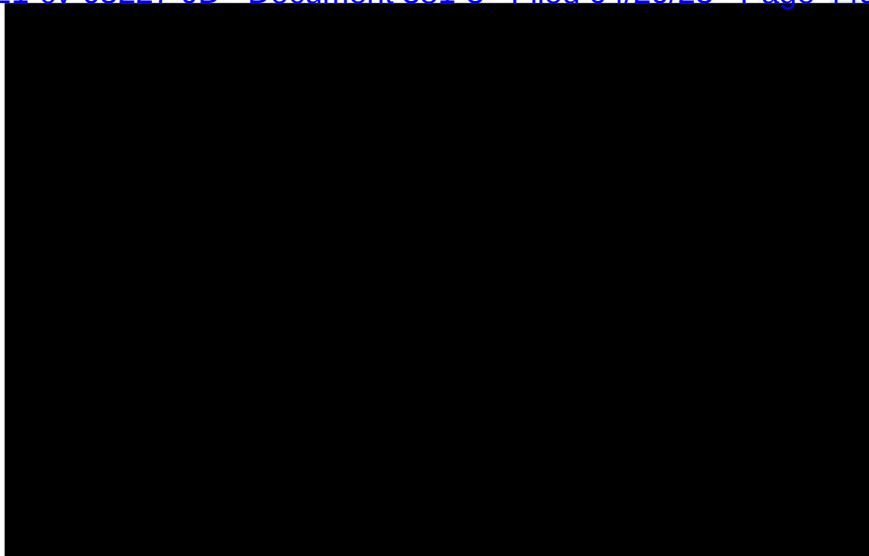95% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 54.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 55.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
89% (for the corresponding app developer).

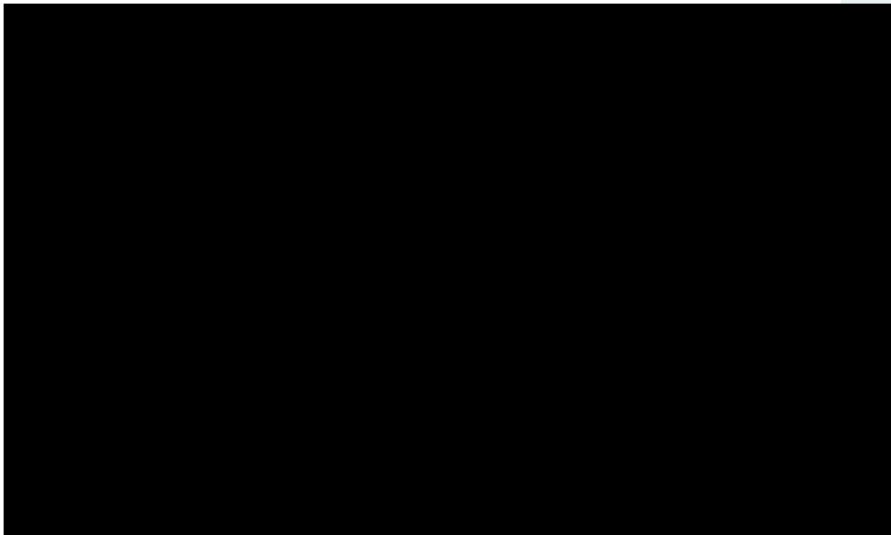Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 58.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
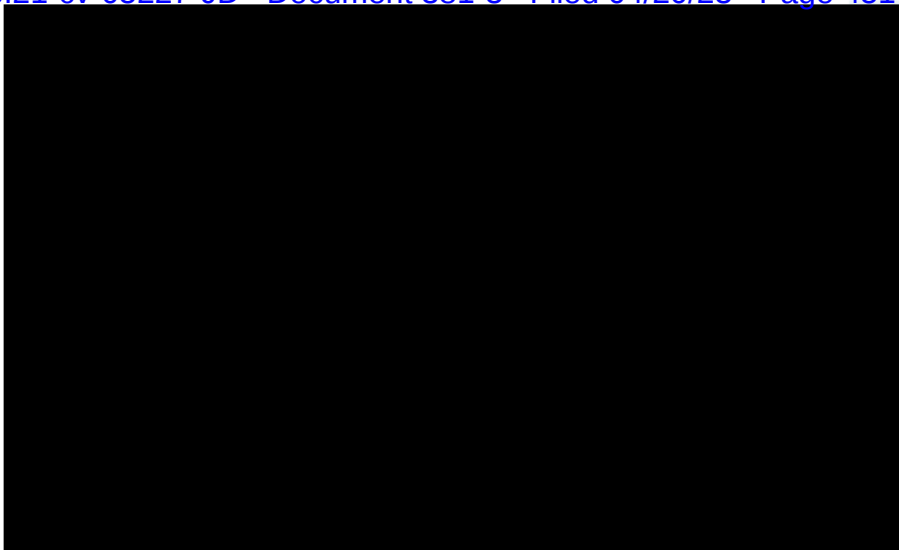98% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 59.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 91% (for the corresponding app category);
91% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 60.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
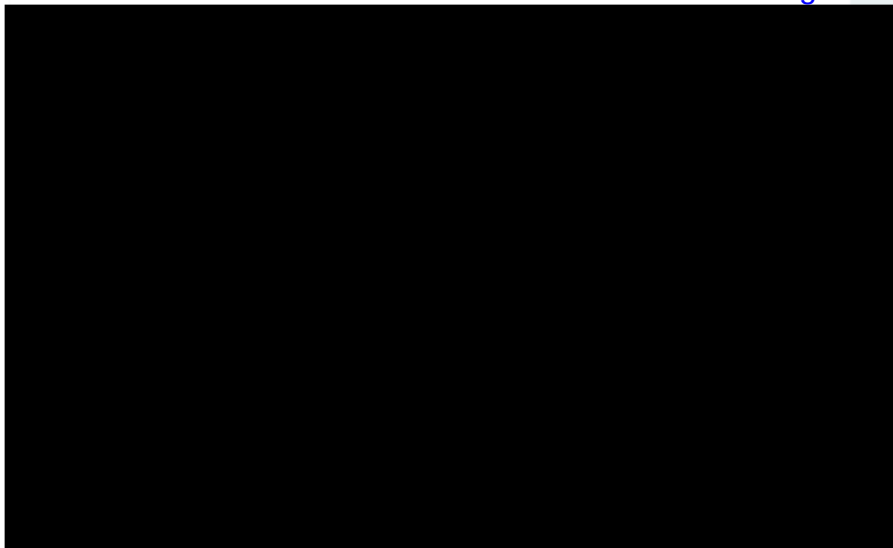98% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 61.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
90% (for the corresponding app developer).

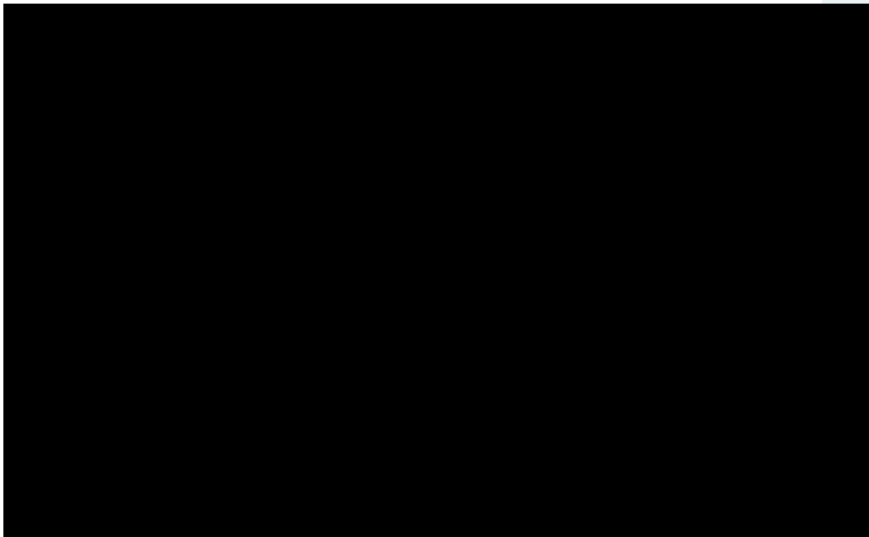Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 64.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 82% (for the corresponding app category);
66% (for the corresponding app developer).

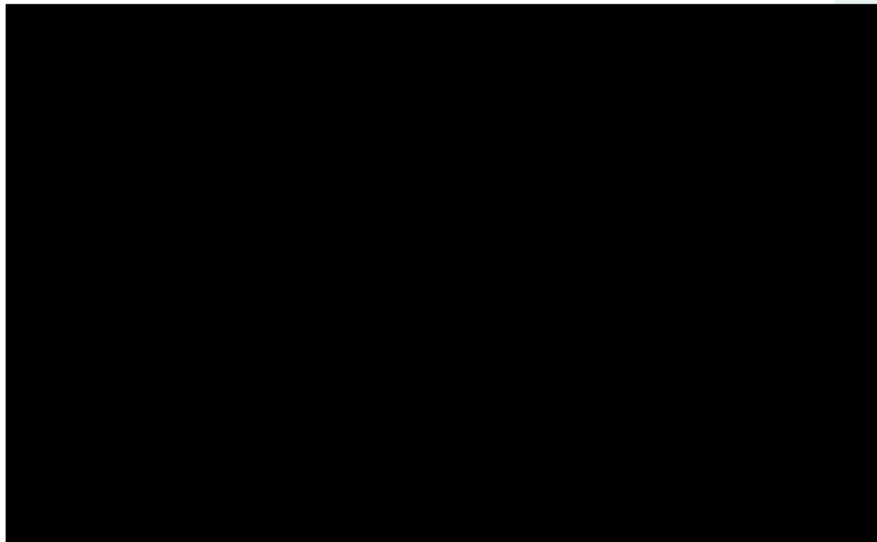Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 65.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 73.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 62% (for the corresponding app category);
94% (for the corresponding app developer).

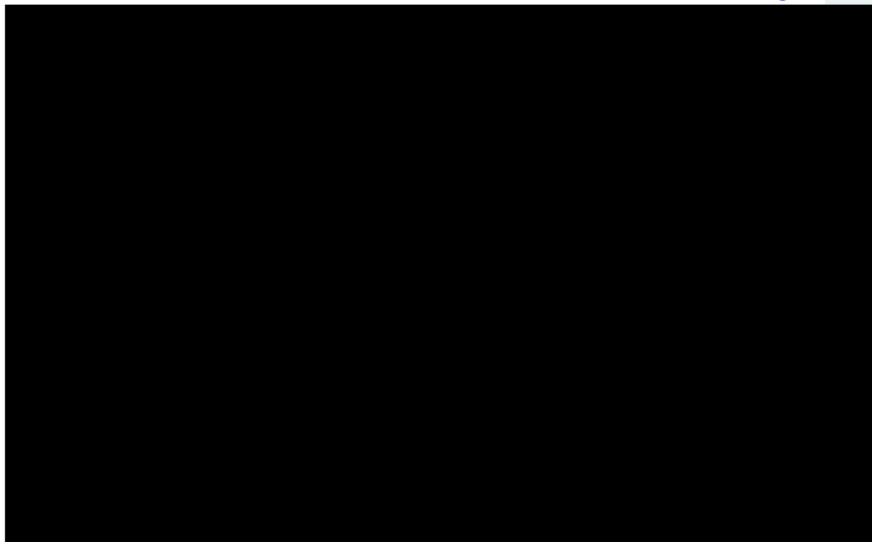Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 74.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
99% (for the corresponding app developer).

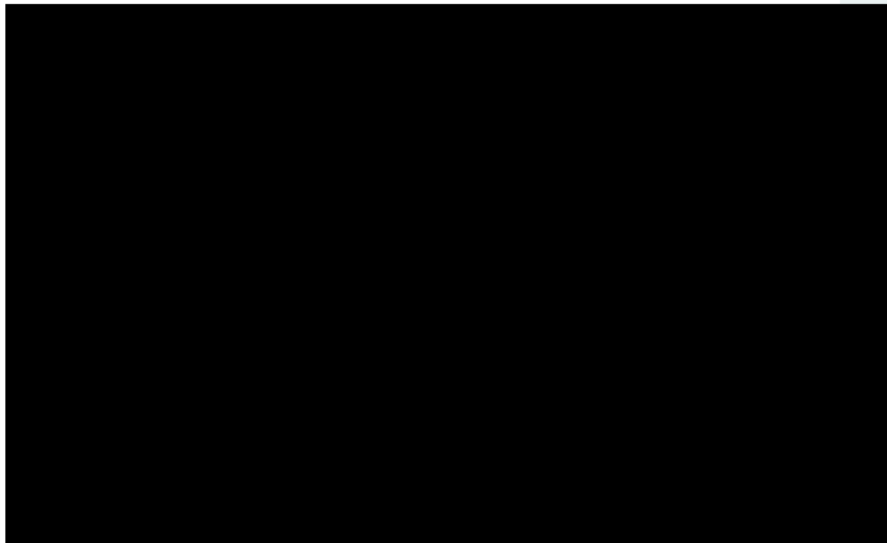Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 76.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 77.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 78.
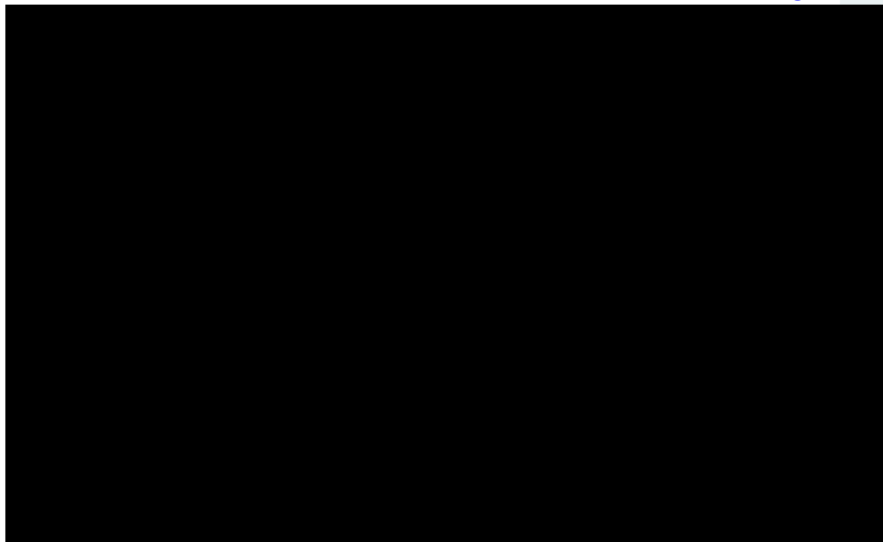[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 81.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 82.
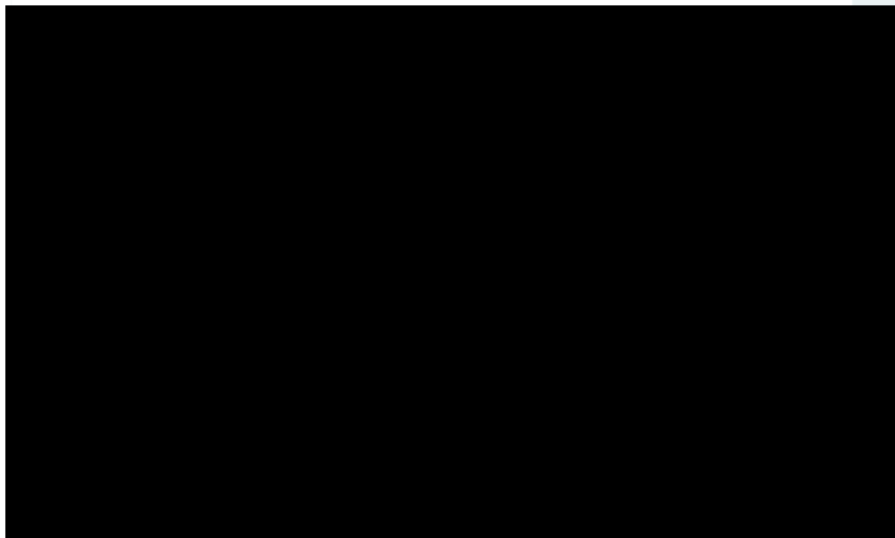[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 79% (for the corresponding app category);
93% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 85.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 91% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 86.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 95% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 87.
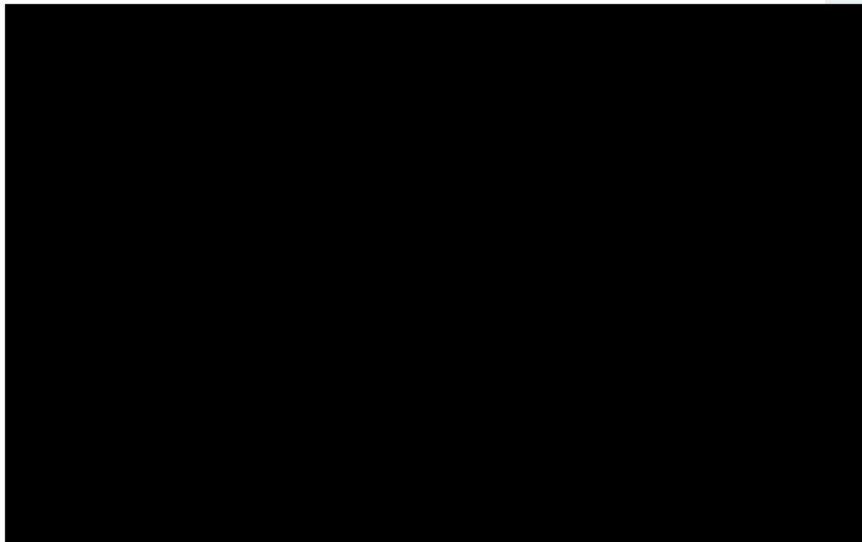[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 72% (for the corresponding app category);
94% (for the corresponding app developer).

　　　Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 89.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
92% (for the corresponding app developer).

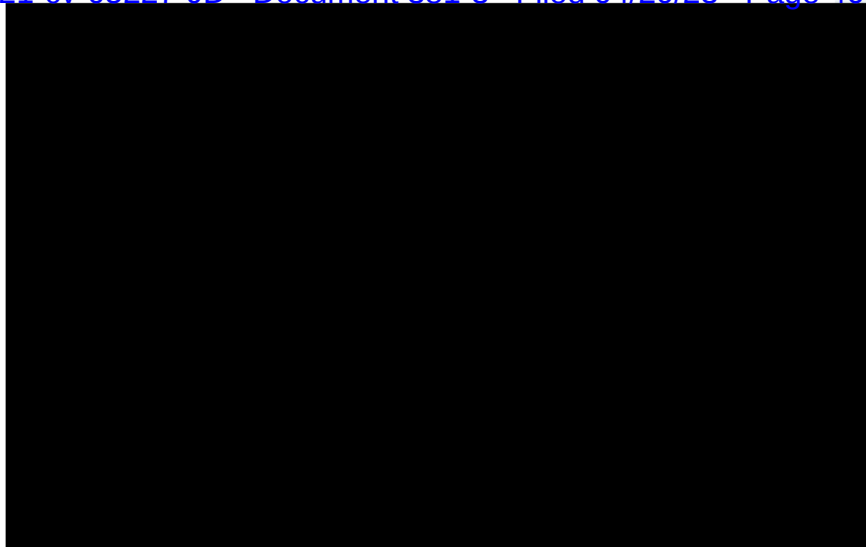Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 93.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
91% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 94.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
91% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 96.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 97.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category); 99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 99.
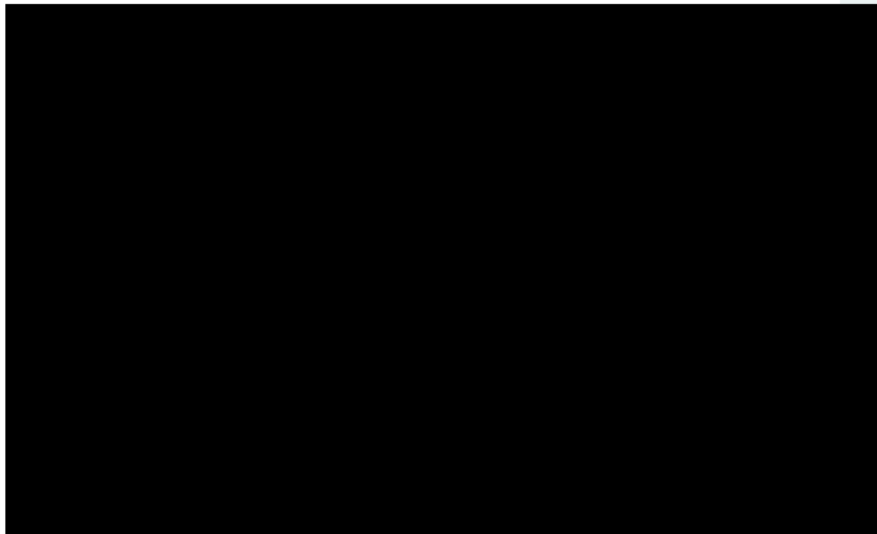[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
88% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 5.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 69% (for the corresponding app category);
55% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 7.
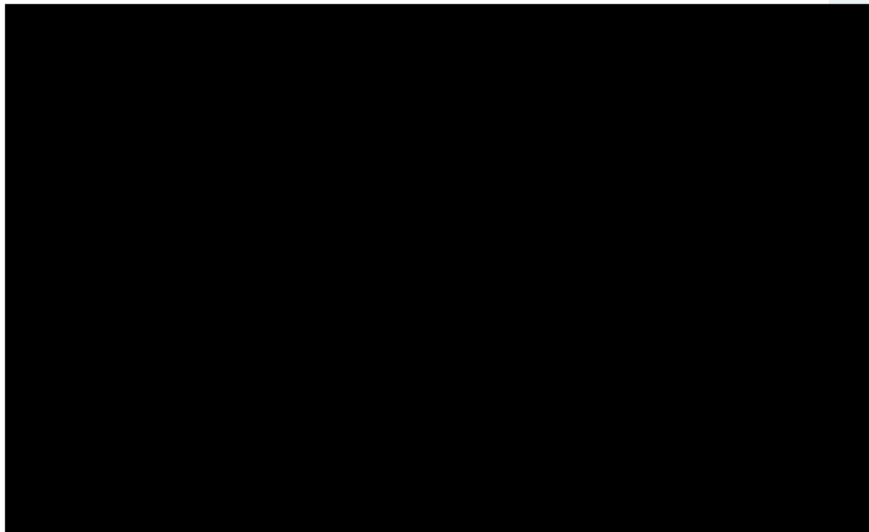[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 91% (for the corresponding app category); 96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 10.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 95% (for the corresponding app category);
88% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 12.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 14.
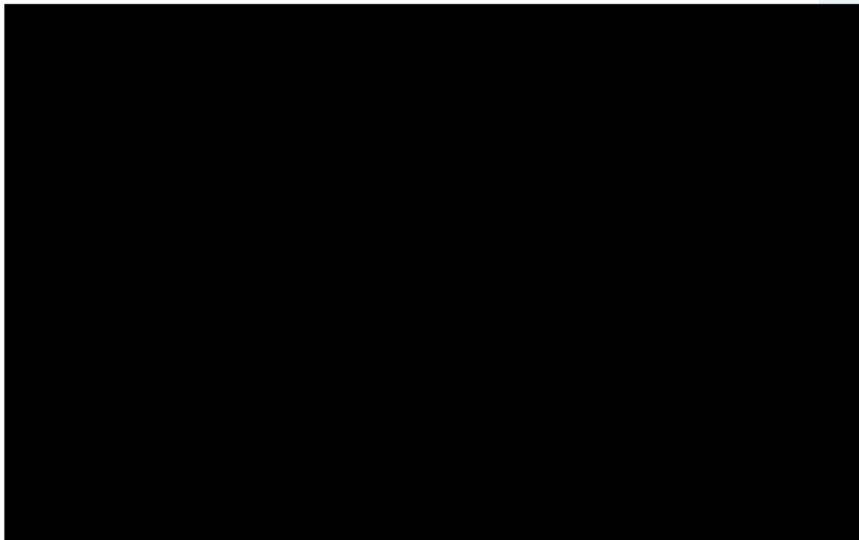[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
89% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 17.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
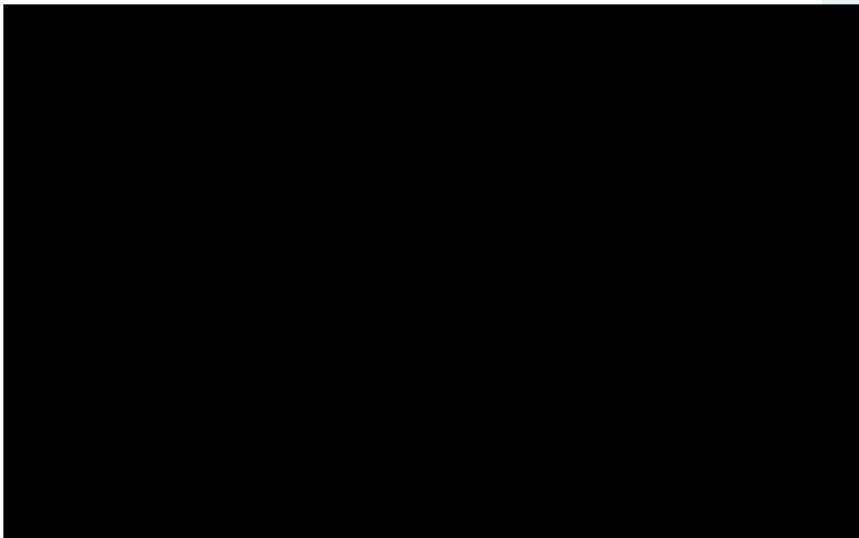97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 19.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 91% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 22.
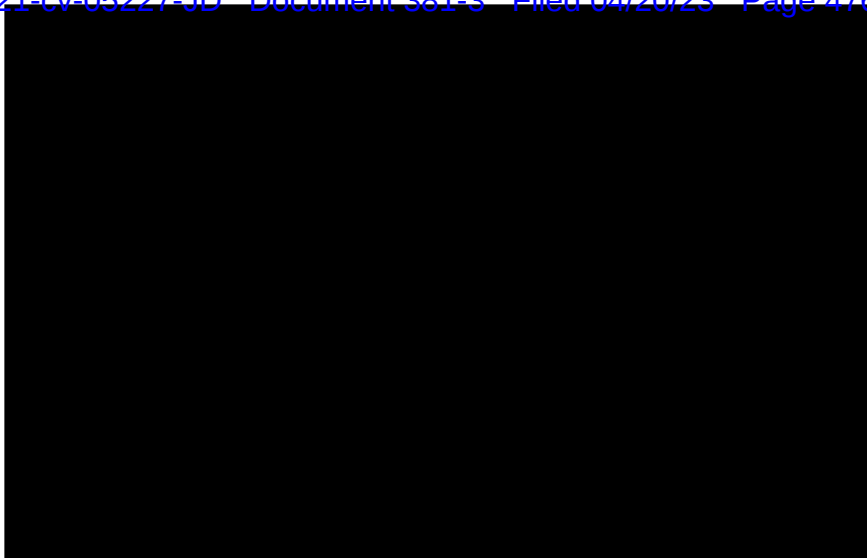[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 23.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
98% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 24.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
85% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 28.
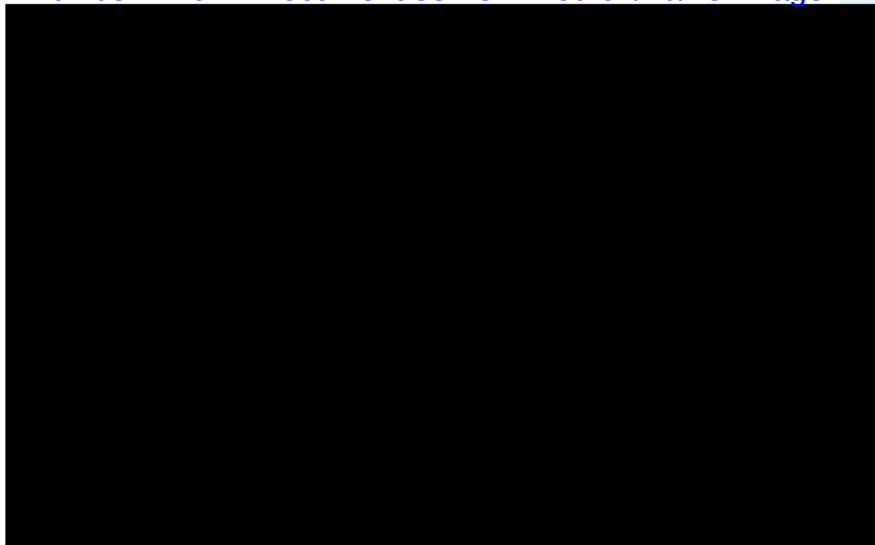[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 68% (for the corresponding app category);
92% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 30.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
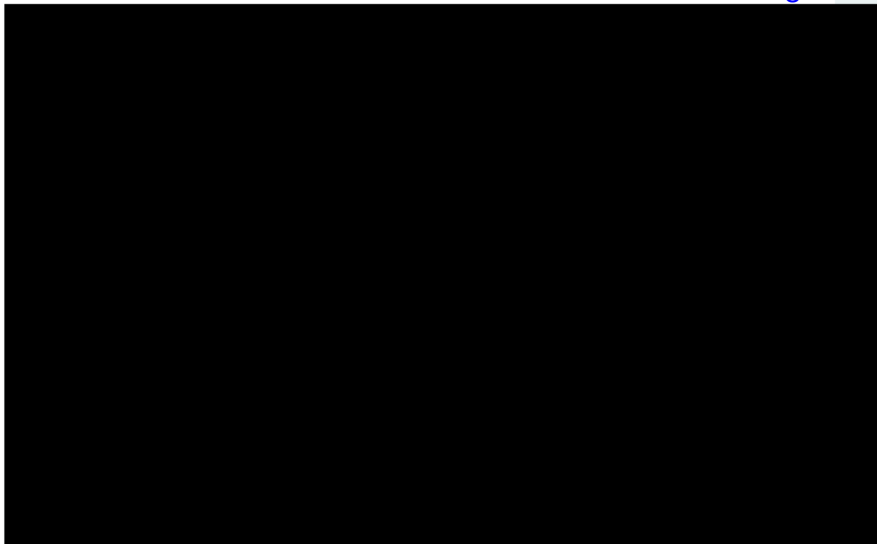87% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 31.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 33.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 36.
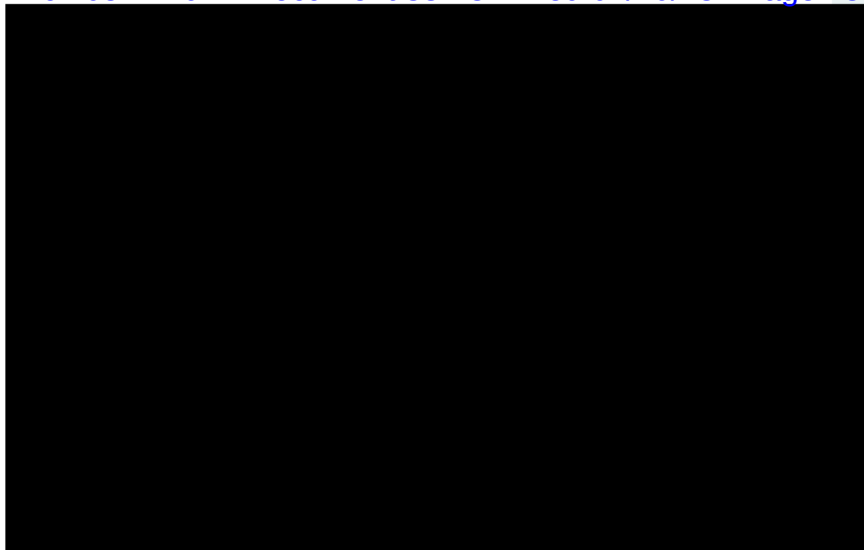[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 39.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 51% (for the corresponding app category);
89% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 40.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
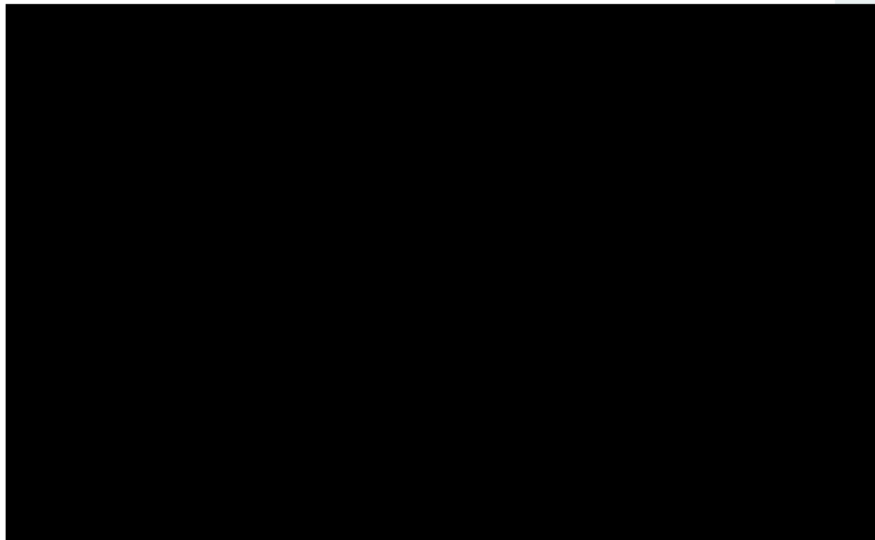99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 41.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
90% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 48.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
88% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 50.
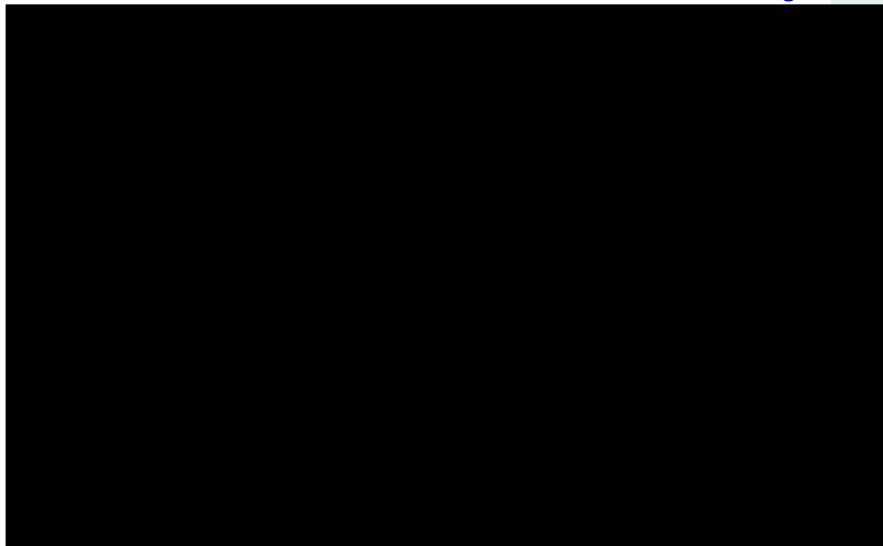[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 53.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 56.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 62% (for the corresponding app category);
91% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 57.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 63.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 66.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 72.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 75.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
90% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 79.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
91% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 84.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 88.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 92.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
87% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 100.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category); 97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 8.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
87% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 9.
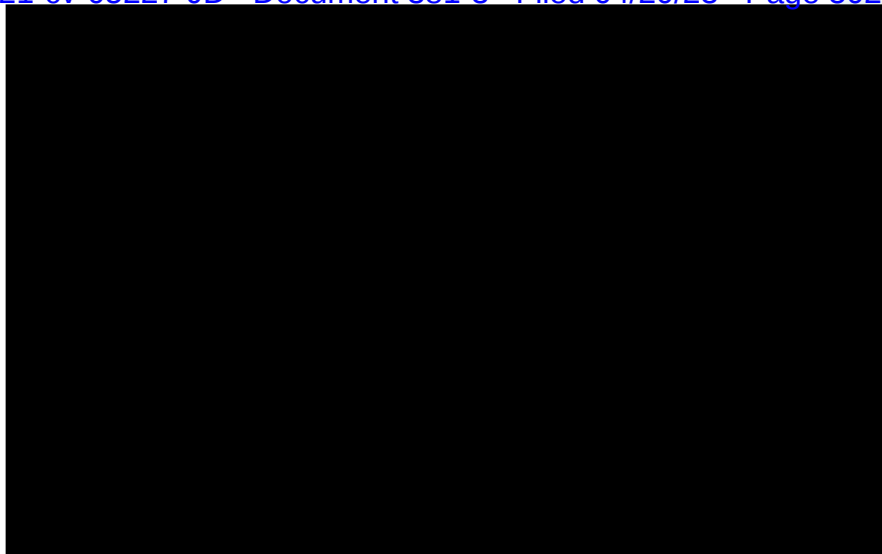[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 91% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 16.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 34.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category); 88% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 37.
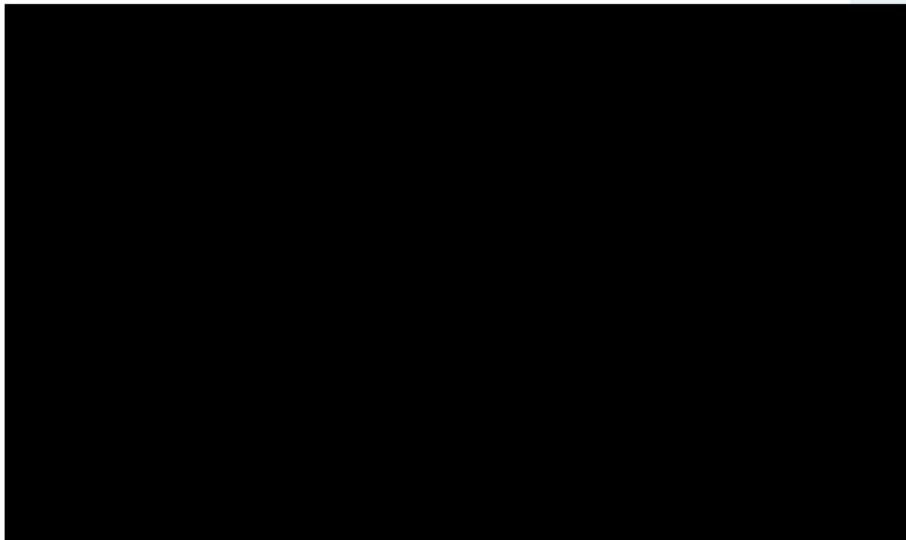[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
91% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 42.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
92% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 44.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
85% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 45.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
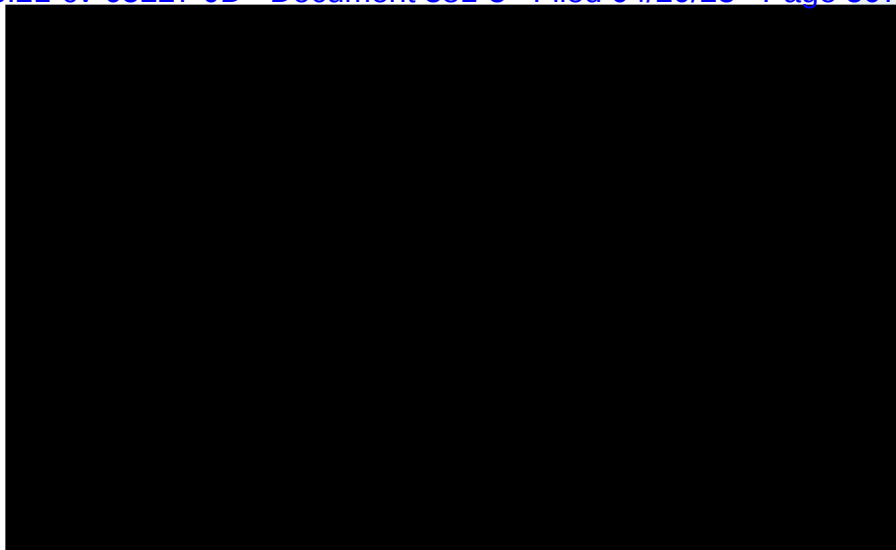[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
94% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 46.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 49.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
97% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 52.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
90% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 62.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 67.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category); 98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 68.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
91% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 69.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
93% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 70.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 71.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
92% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 80.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
99% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 83.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
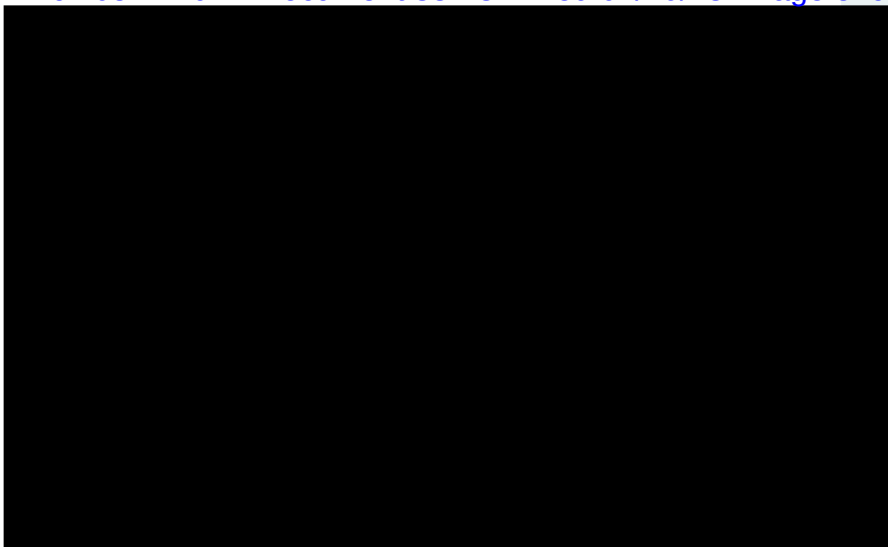[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 90.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 91.
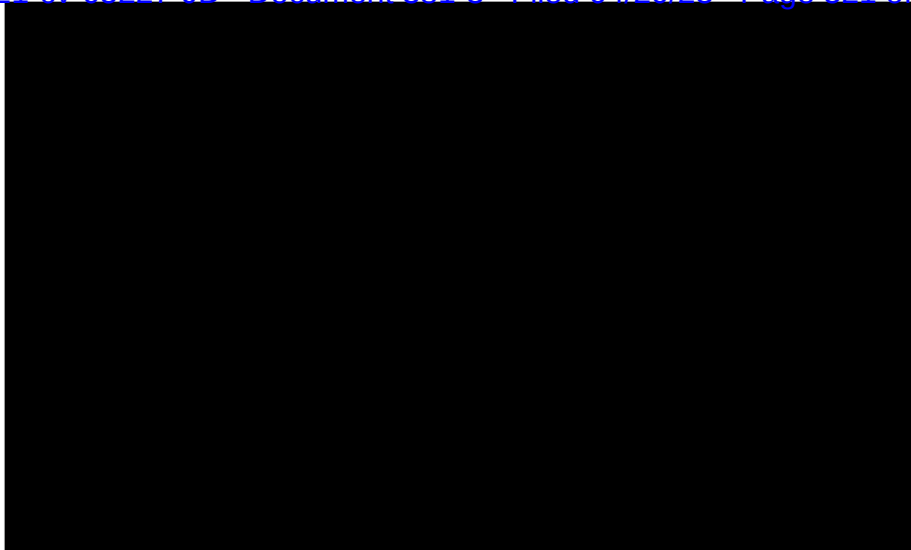[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 95.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
90% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 98.
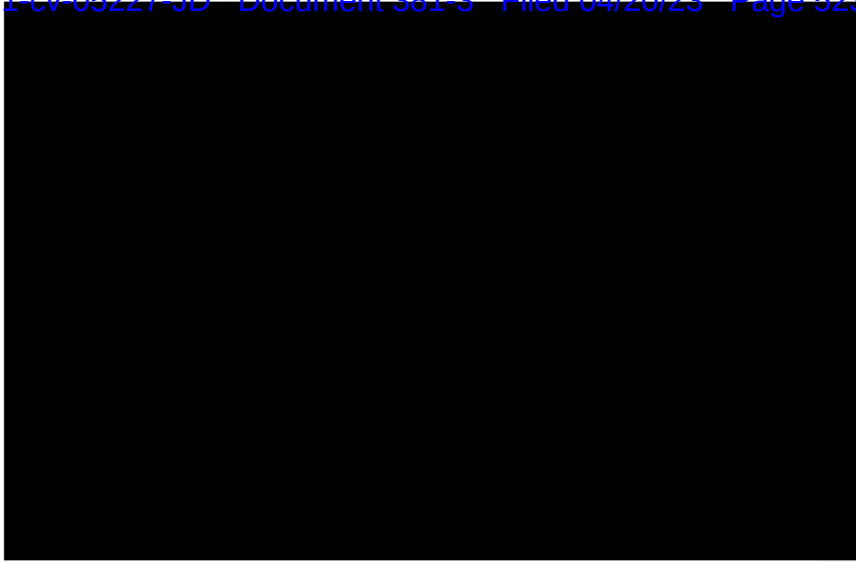[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category); 95% (for the corresponding app developer).

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Exhibit 35b

Average Monthly Product Price and Service Fee Rate for the Top 100 Paid Apps

With A Service Fee Rate Reduction of At Least 10 Percentage Points in July 2021

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 2.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
93% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 3.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
82% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 4.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
90% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 5.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 7.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
95% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 9.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 62% (for the corresponding app category);
80% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 15.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 17.
[2] Price change before and after July 2021: no change in list price, no change in net price.
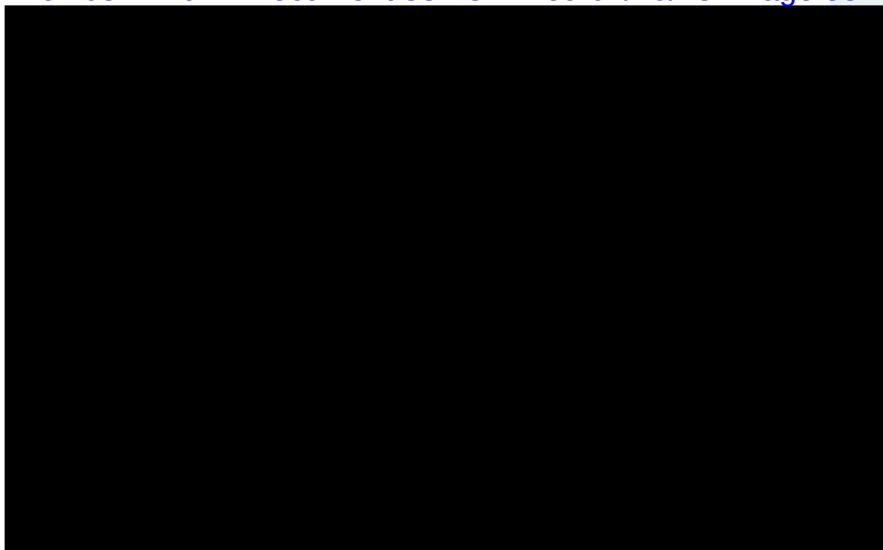[3] Pass-through rate predicted by Dr. Singer's approach: 95% (for the corresponding app category);
82% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 18.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 20.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
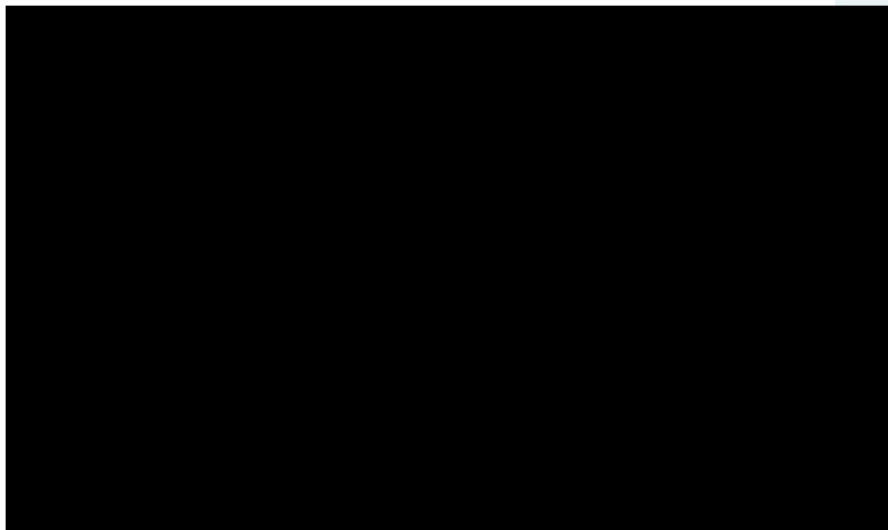87% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 21.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
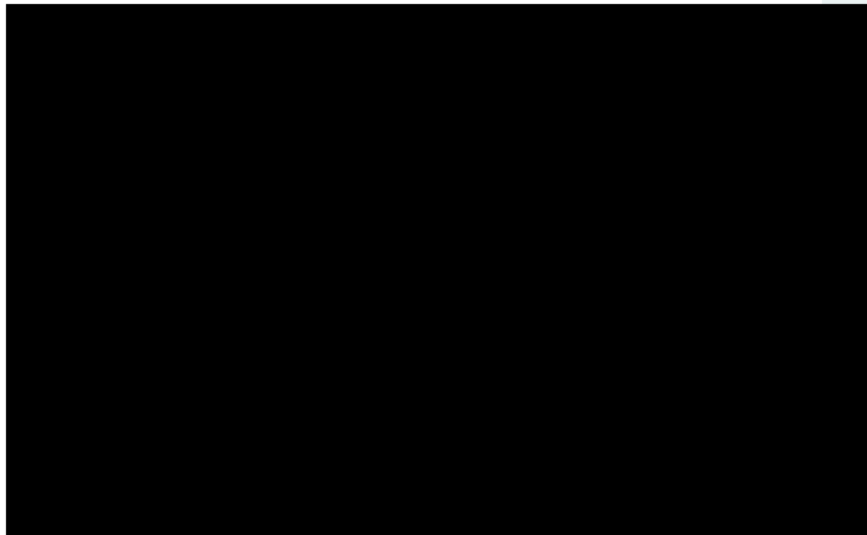85% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 24.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
53% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 27.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category); 98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 29.
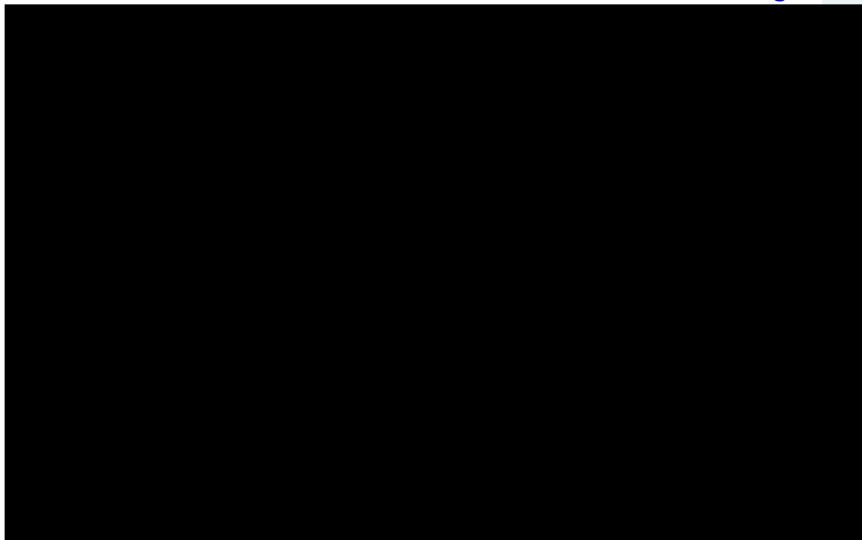[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 31.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 93% (for the corresponding app category);
88% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 35.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
85% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 36.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 37.
[2] Price change before and after July 2021: no change in list price, no change in net price.
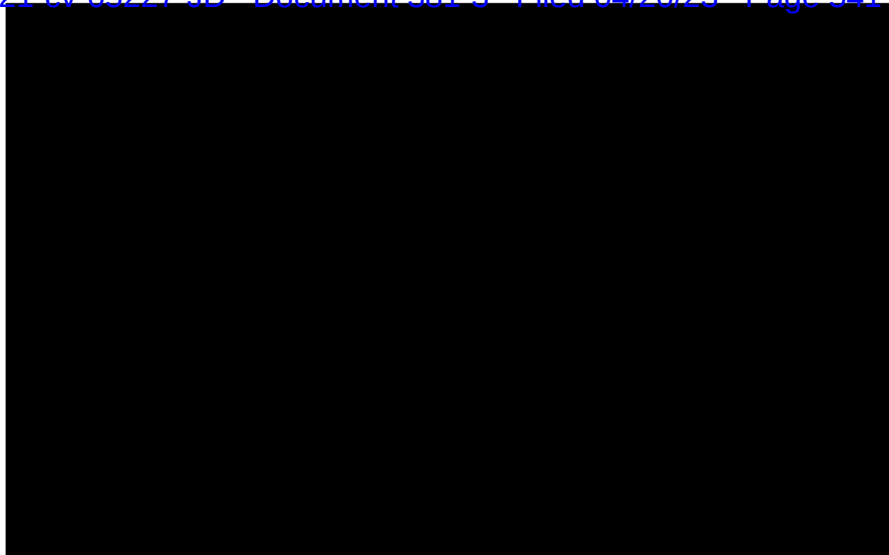[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
85% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 38.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 39.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
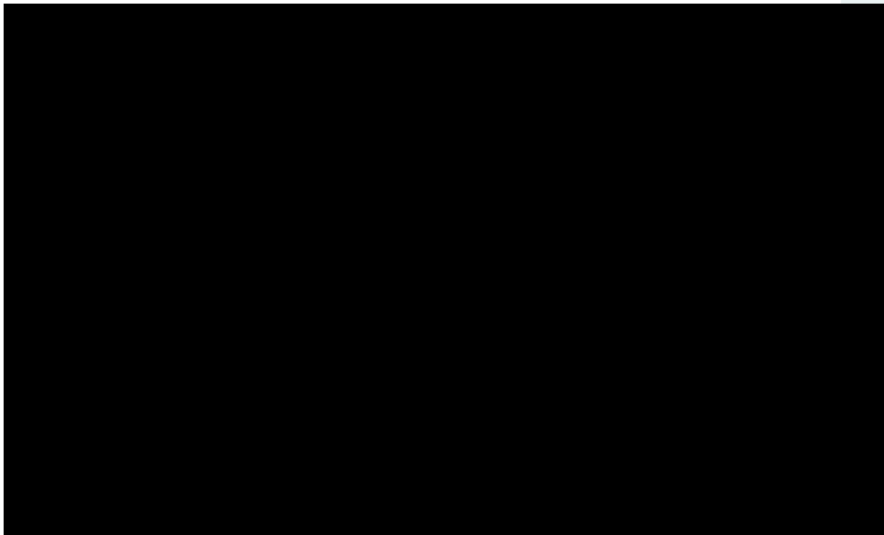99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 41.
[2] Price change before and after July 2021: no change in list price, no change in net price.
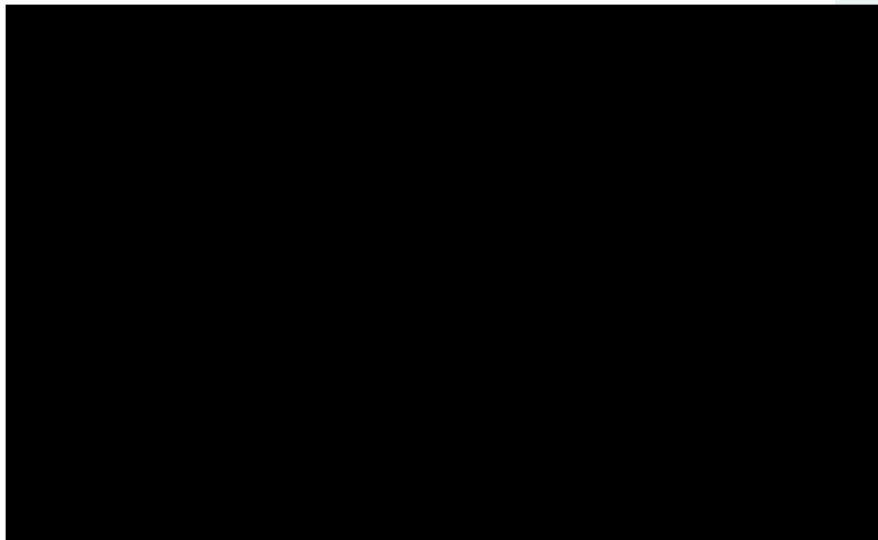[3] Pass-through rate predicted by Dr. Singer's approach: 79% (for the corresponding app category);
93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 42.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 43.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 44.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 47.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
85% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 48.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 52.
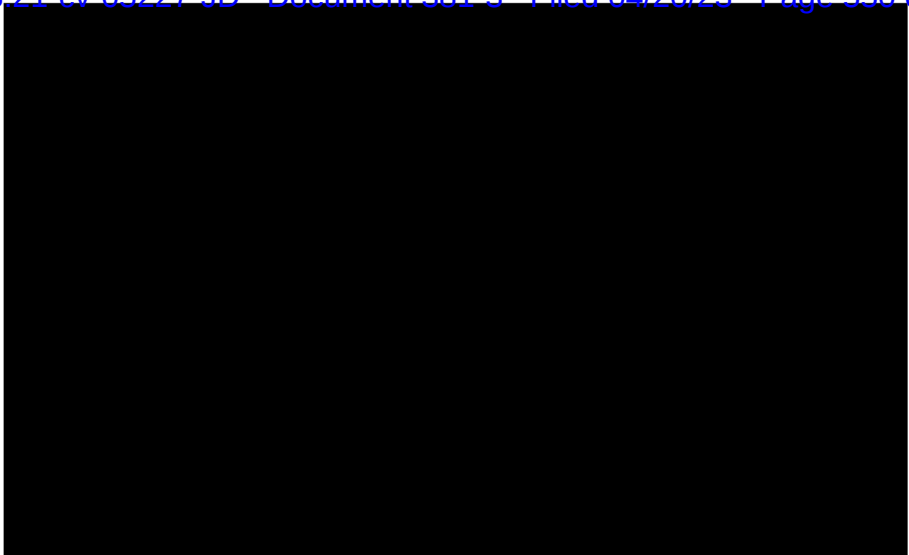[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
95% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 58.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 82% (for the corresponding app category);
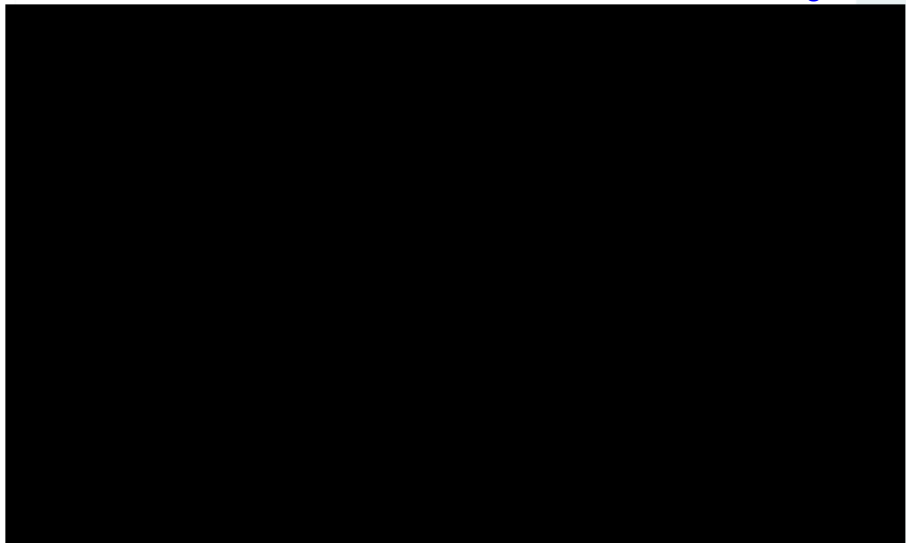89% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 63.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
95% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 69.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
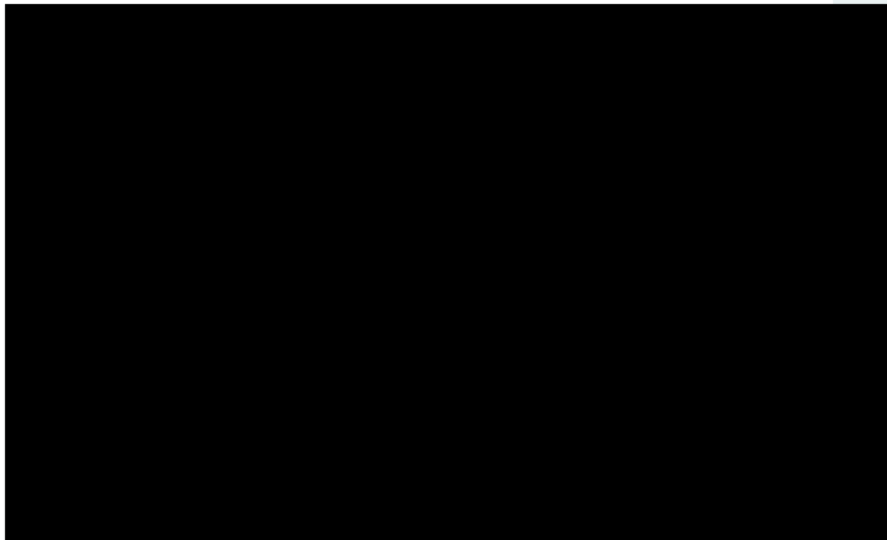99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 71.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
85% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 74.
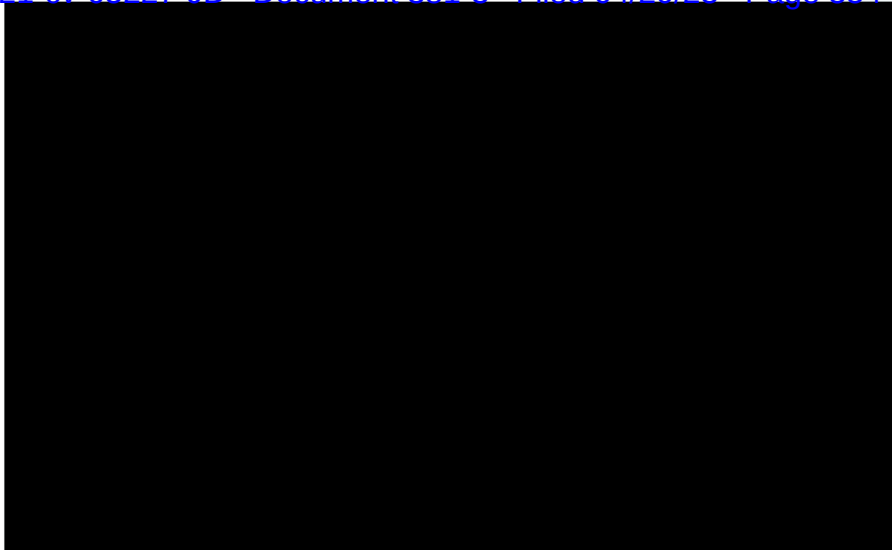[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
95% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 77.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 78.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
89% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 83.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 85.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 91% (for the corresponding app category);
91% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 86.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 87.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
90% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 90.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 82% (for the corresponding app category);
66% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 92.
[2] Price change before and after July 2021: no change in list price, no change in net price.
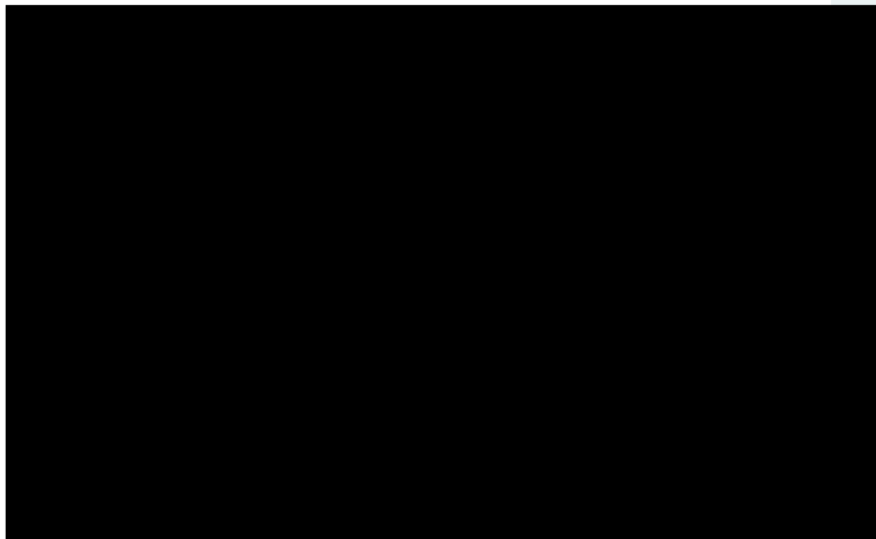[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 100.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 62% (for the corresponding app category);
94% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 1.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
49% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 8.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 69% (for the corresponding app category);
55% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 10.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
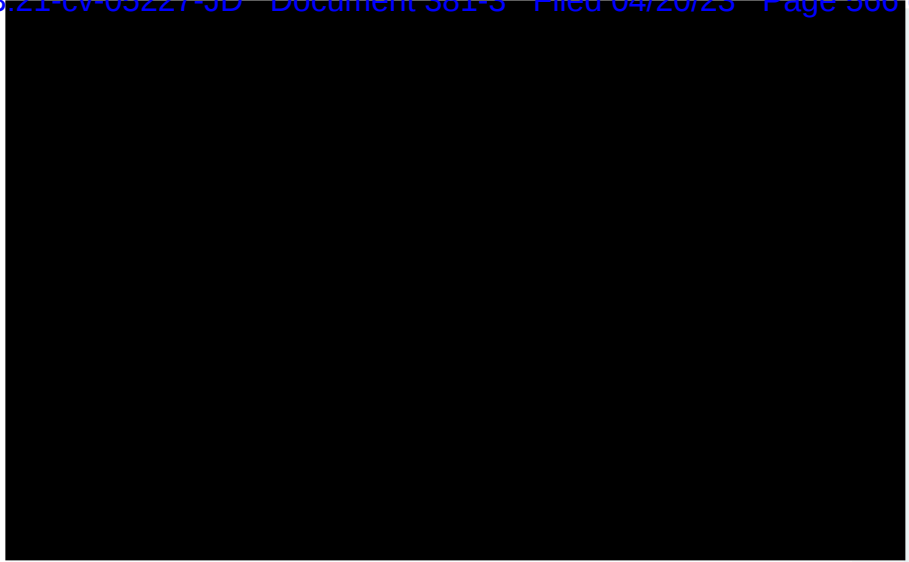96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 11.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 91% (for the corresponding app category);
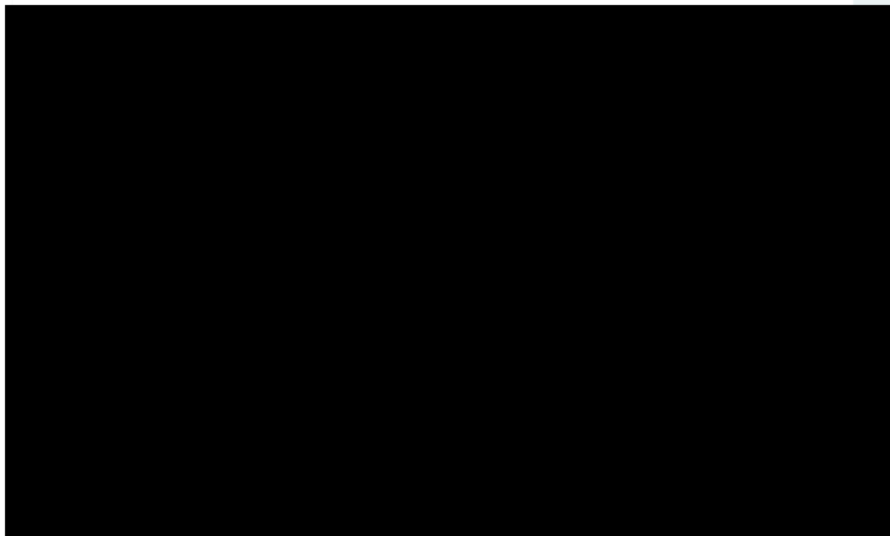96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 13.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
92% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 16.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 95% (for the corresponding app category);
88% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 19.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 22.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
49% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 23.
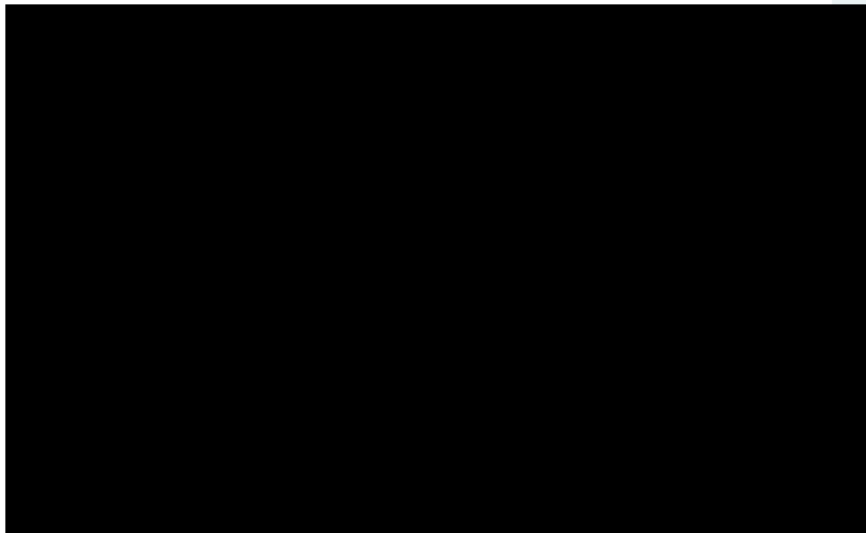[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
89% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 26.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 28.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 91% (for the corresponding app category);
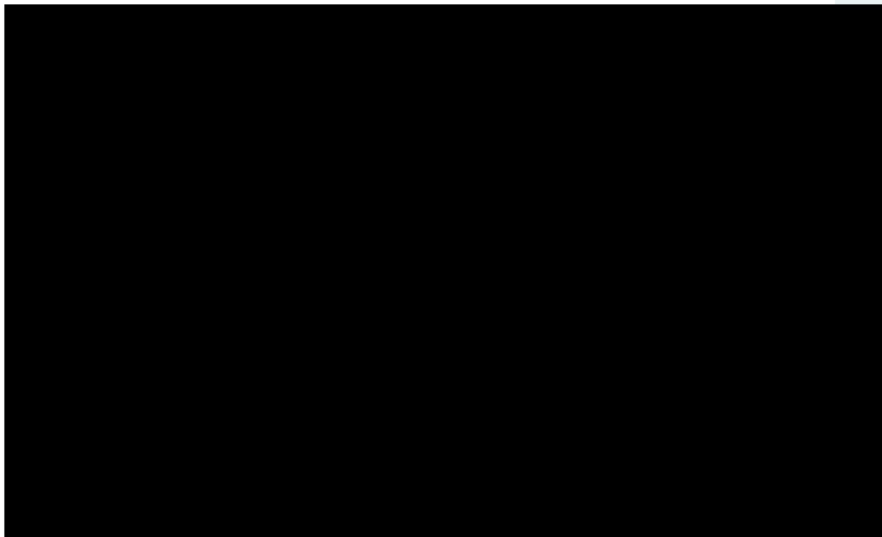96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 30.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
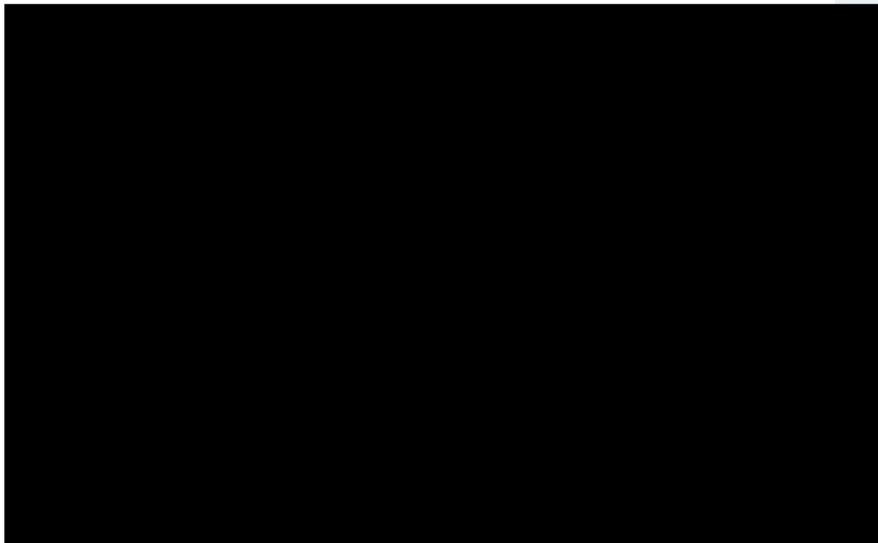49% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 32.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
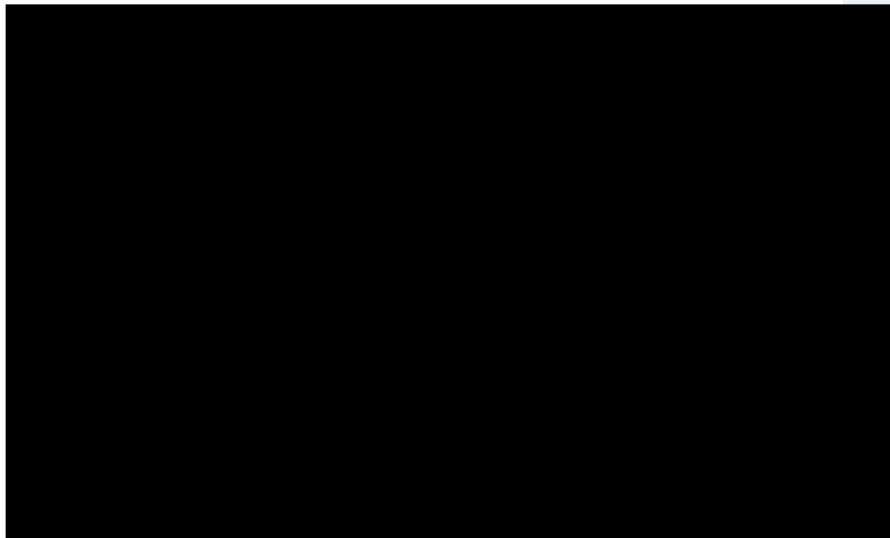98% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 33.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category); 98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 34.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
85% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 40.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 68% (for the corresponding app category);
92% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 45.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
87% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 46.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
93% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 49.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
94% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 50.
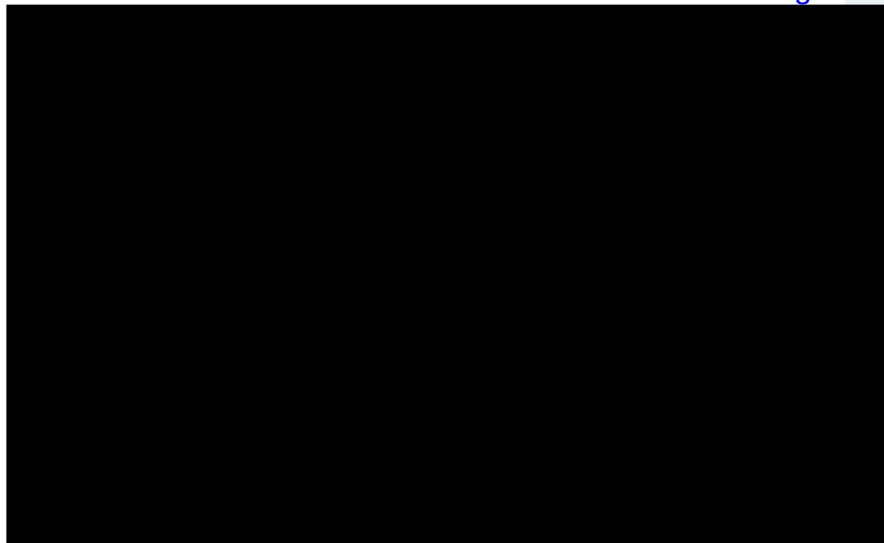[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
99% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 54.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
96% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 55.
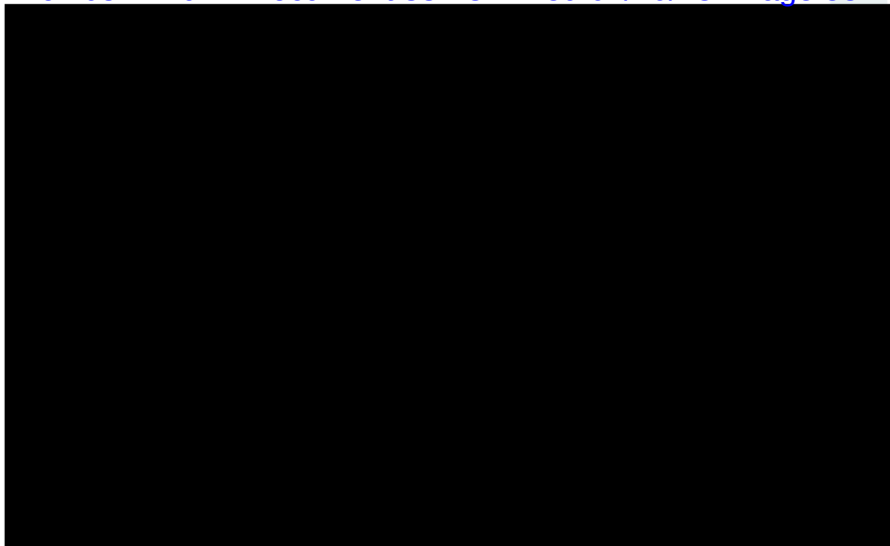[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
97% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 59.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 51% (for the corresponding app category);
89% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 60.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
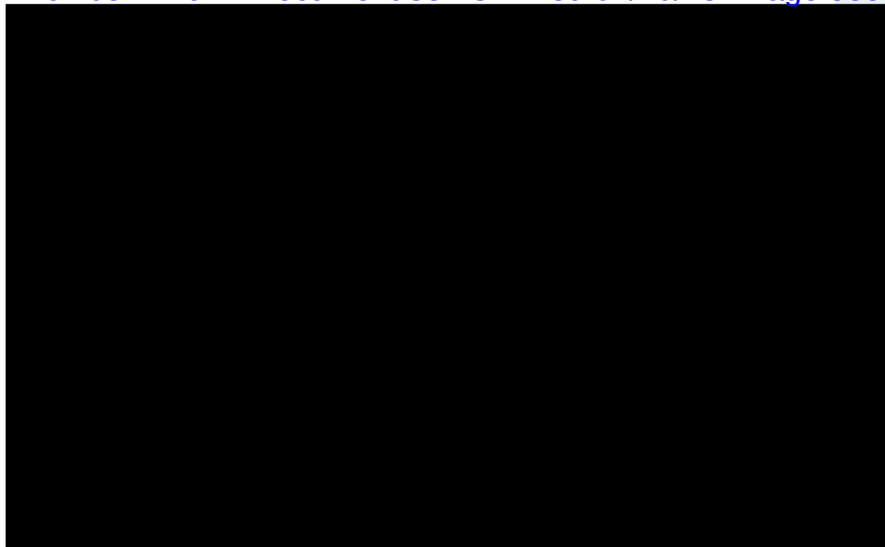99% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 61.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
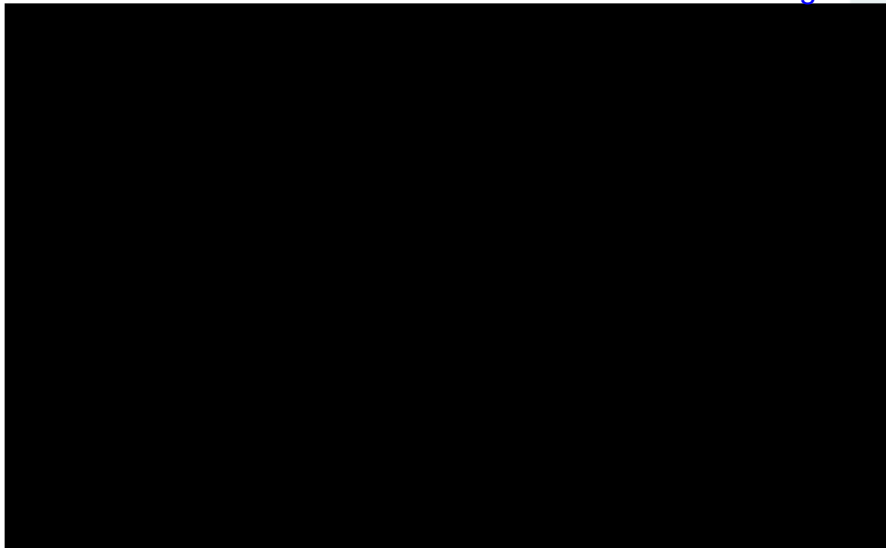90% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 65.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
90% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 68.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
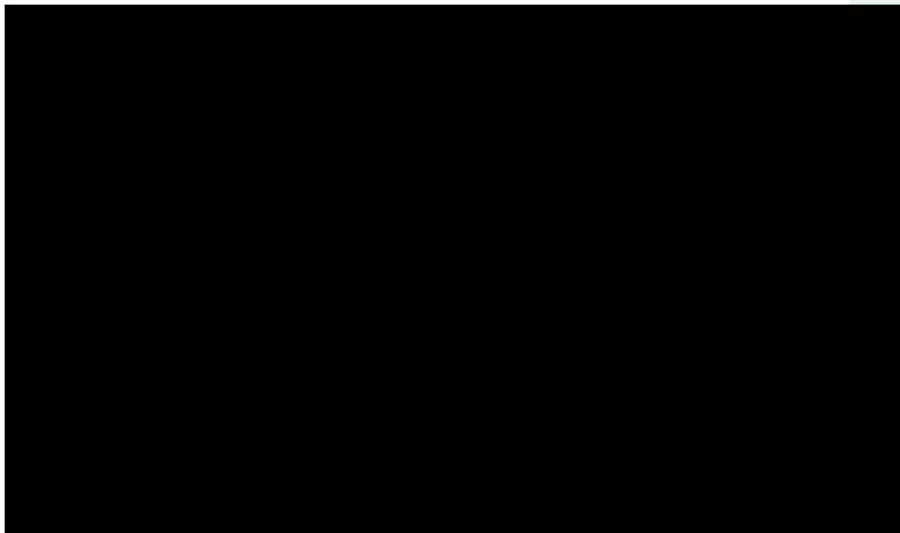94% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 70.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
88% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 73.
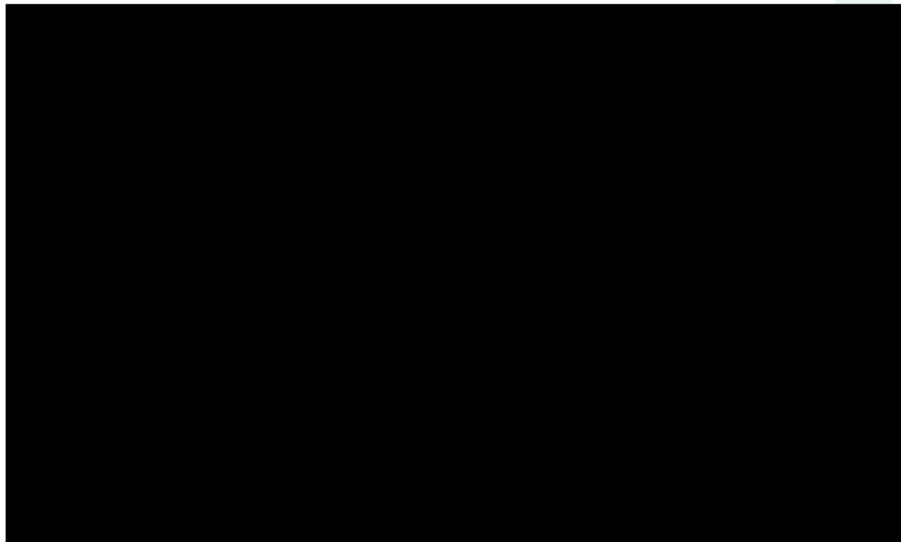[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 76.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
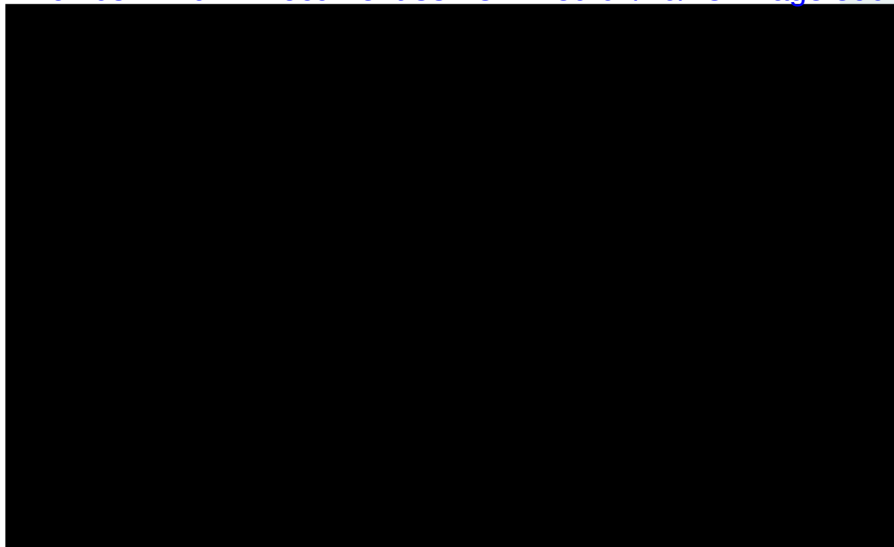98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 79.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 62% (for the corresponding app category);
91% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 81.
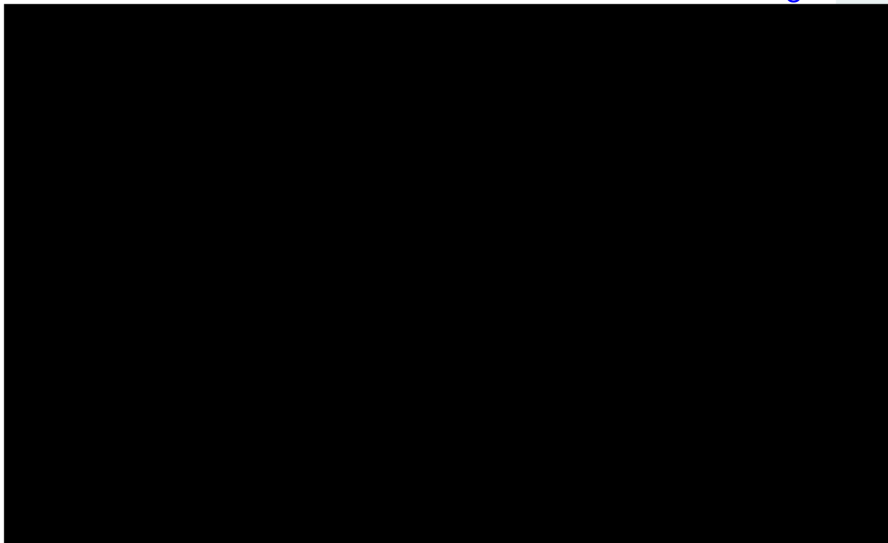[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
94% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 82.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
93% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 84.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
91% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 89.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 93.
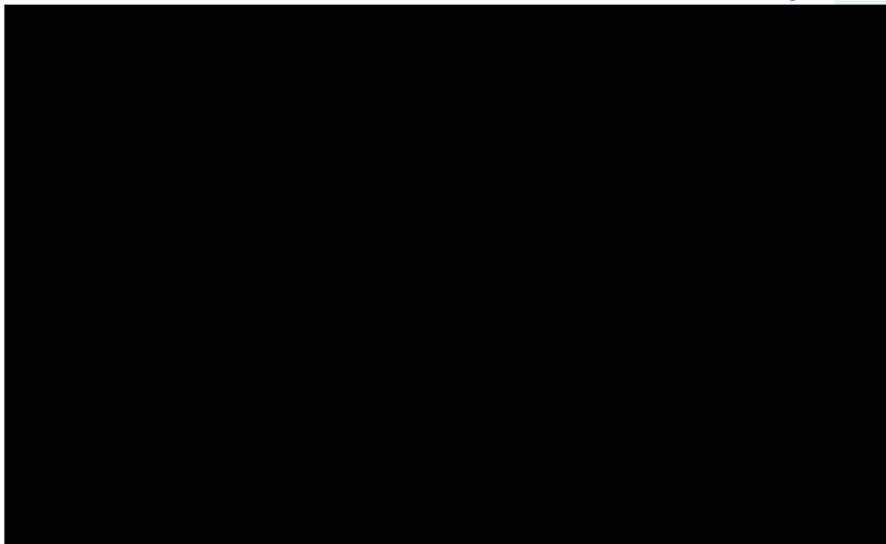[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 99.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 6.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
49% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 12.
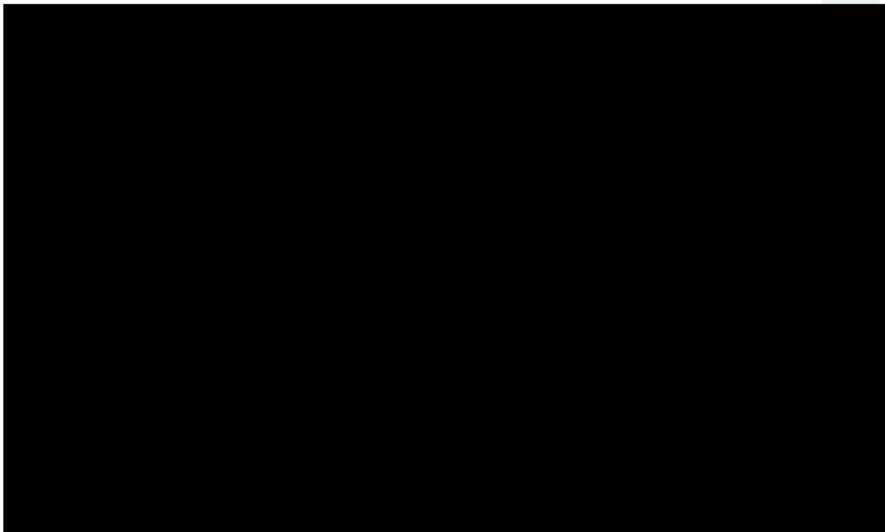[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
87% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 14.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 91% (for the corresponding app category);
96% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 25.
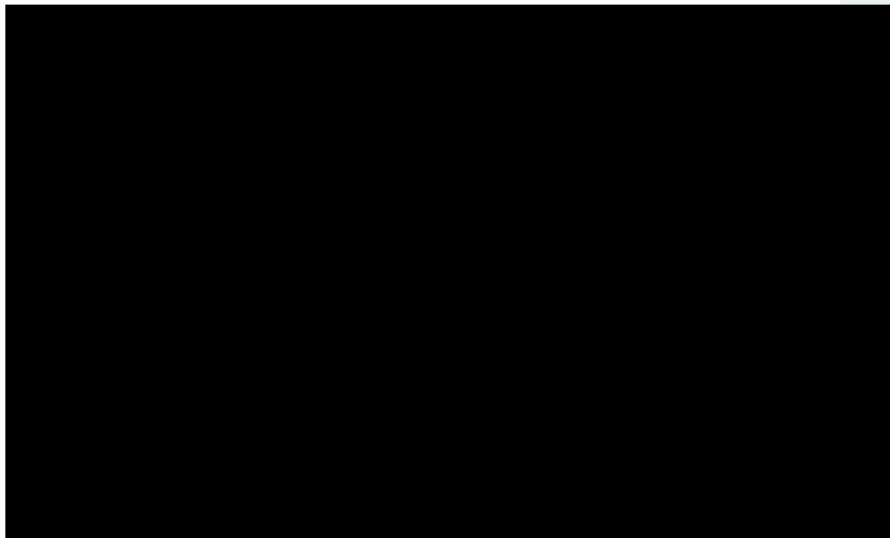[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
97% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 51.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
88% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 53.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
71% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 56.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
92% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 57.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
91% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 62.
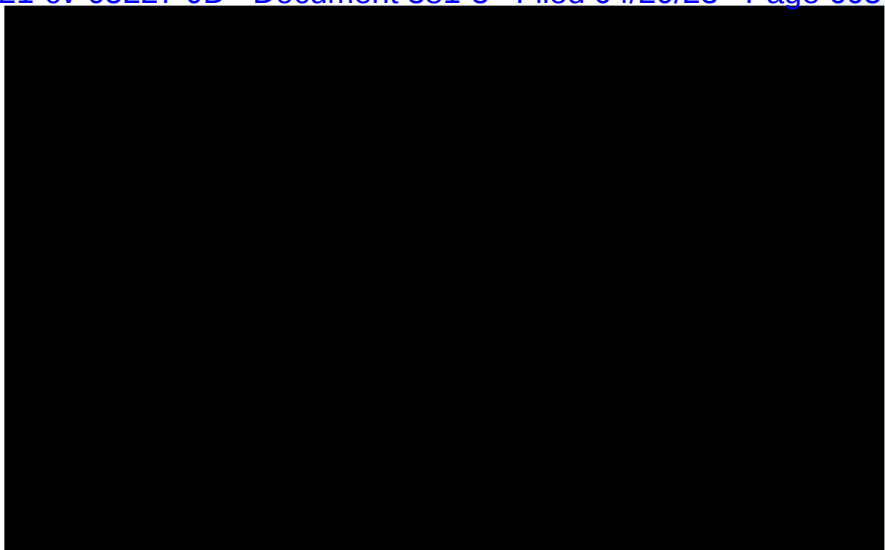[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
92% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 64.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
85% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 66.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
94% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 67.
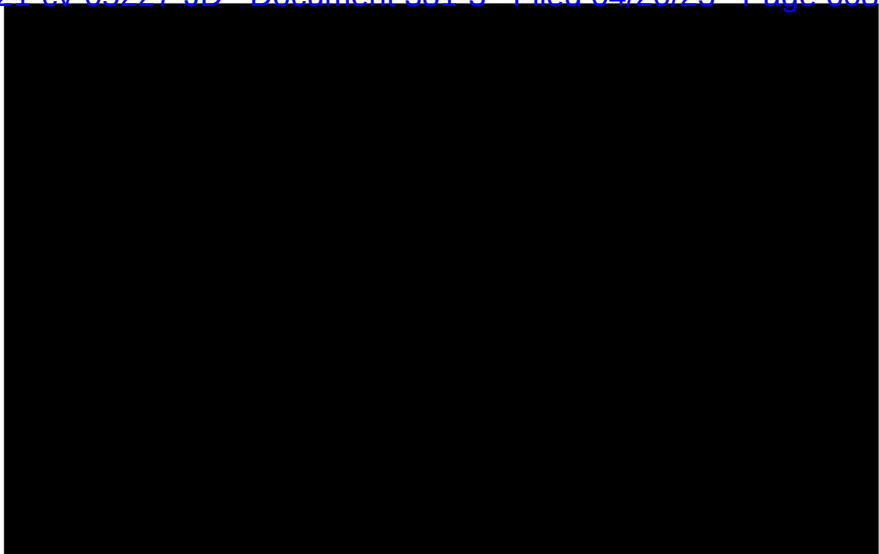[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
97% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 72.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 75.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
90% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 80.
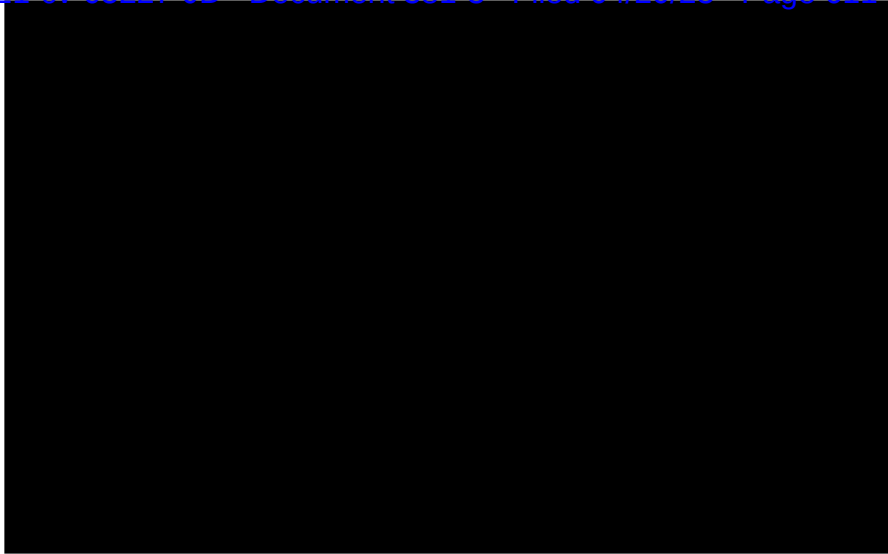[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 93% (for the corresponding app category);
62% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 88.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 91.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 91% (for the corresponding app developer).
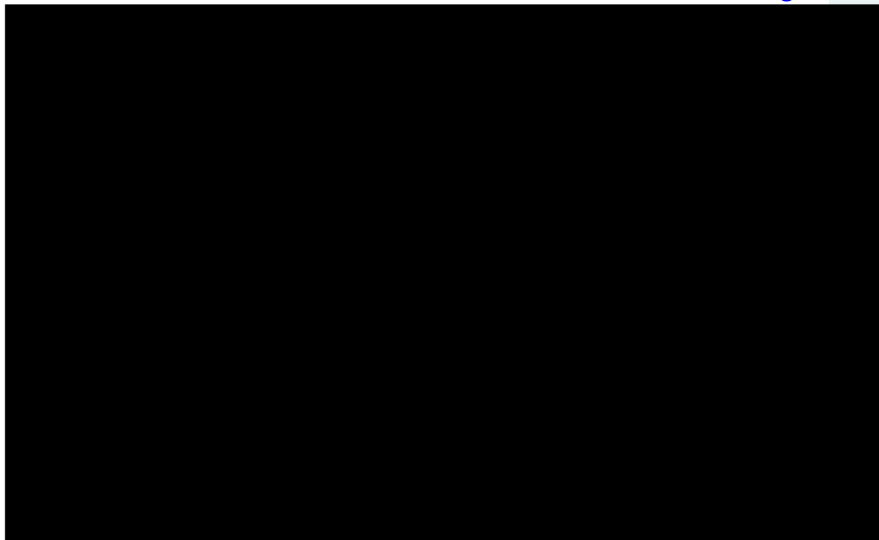
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 94.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 95.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
91% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 96.
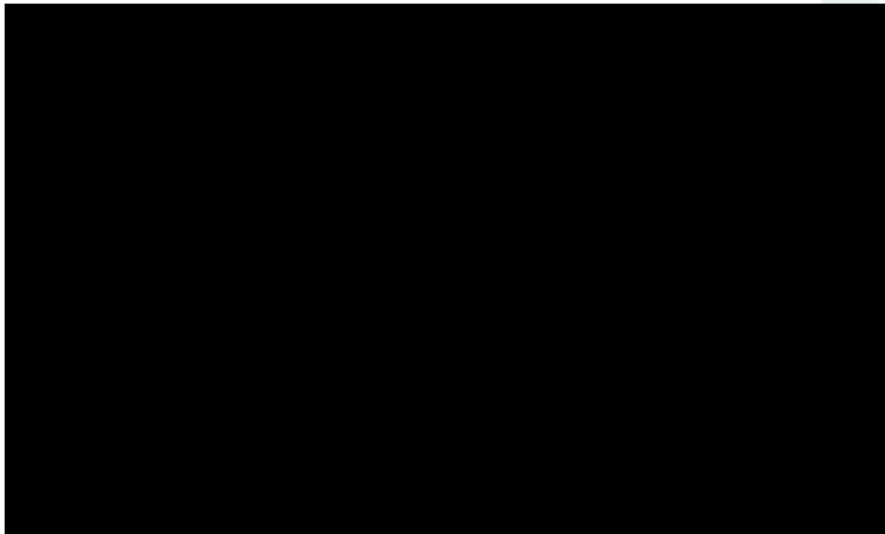[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
93% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 97.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category); 93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 98.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
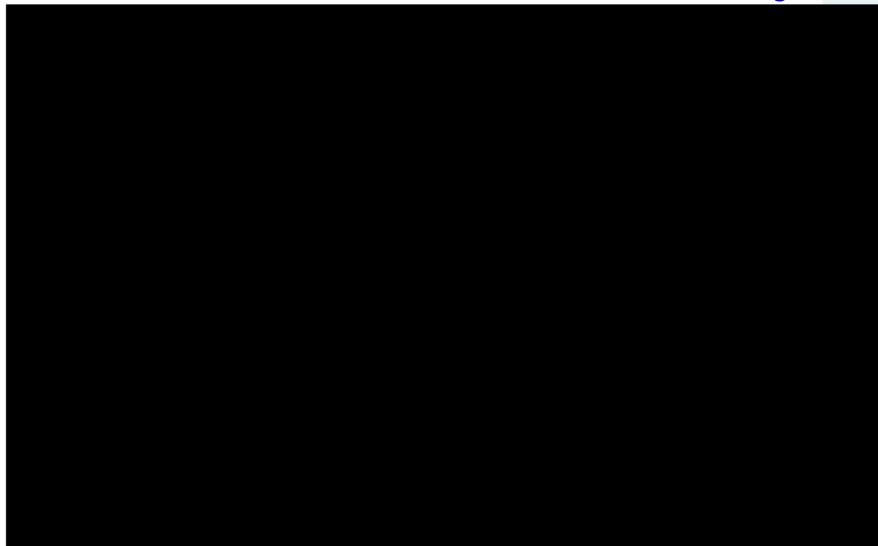92% (for the corresponding app developer).

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Exhibit 35c

Average Monthly Product Price and Service Fee Rate for the Top 100 Paid Apps

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 3.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
88% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 6.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
89% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 7.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
71% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 8.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 9.
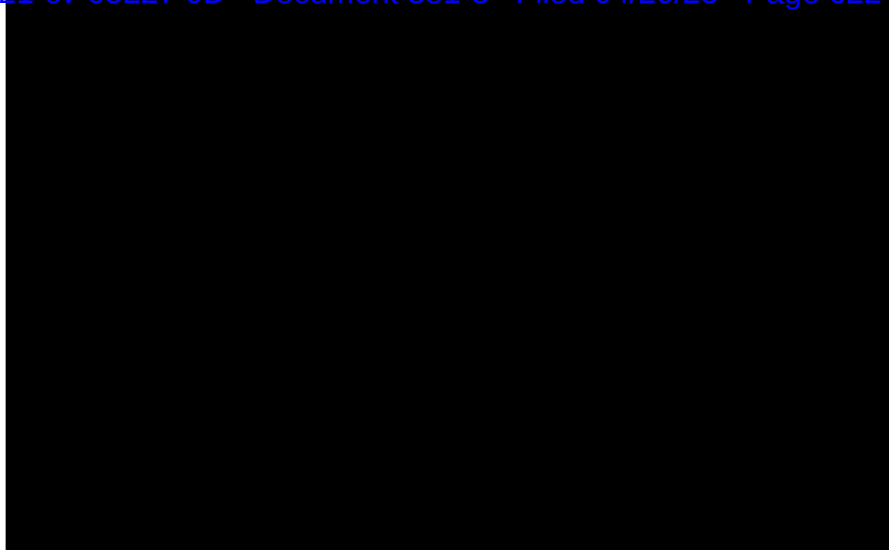[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
82% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 10.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
79% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 11.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
90% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 12.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 13.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 16.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
88% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 18.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
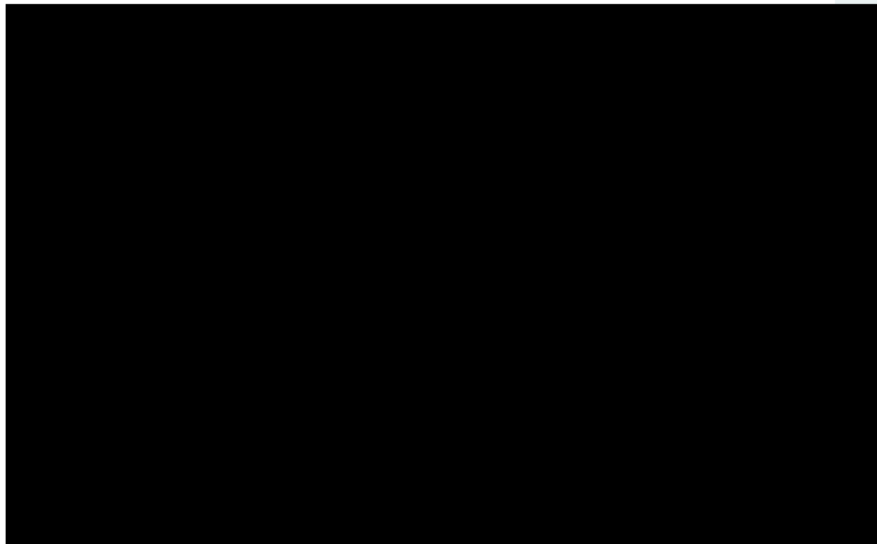[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
95% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 21.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 62% (for the corresponding app category);
80% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 22.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
78% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 23.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
82% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 25.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
79% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 28.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
26% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 33.
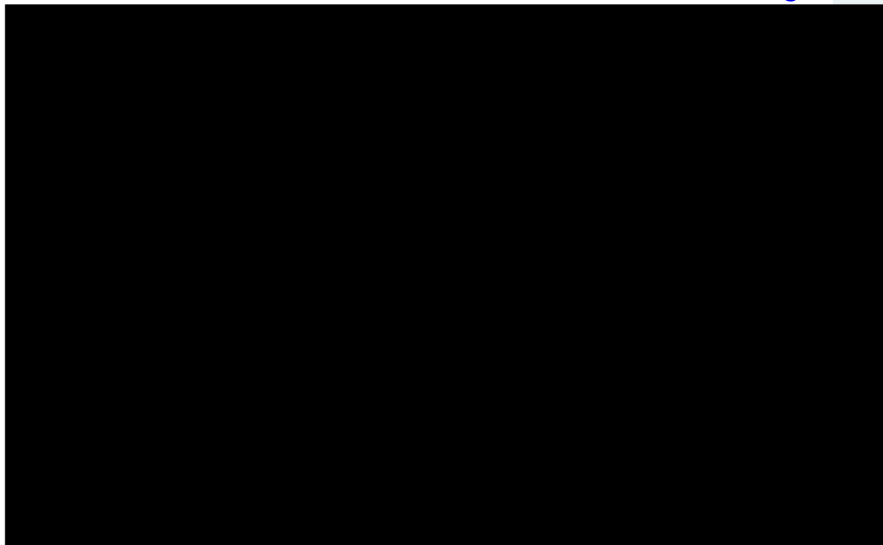[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
90% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 34.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
94% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 35.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
97% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 38.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
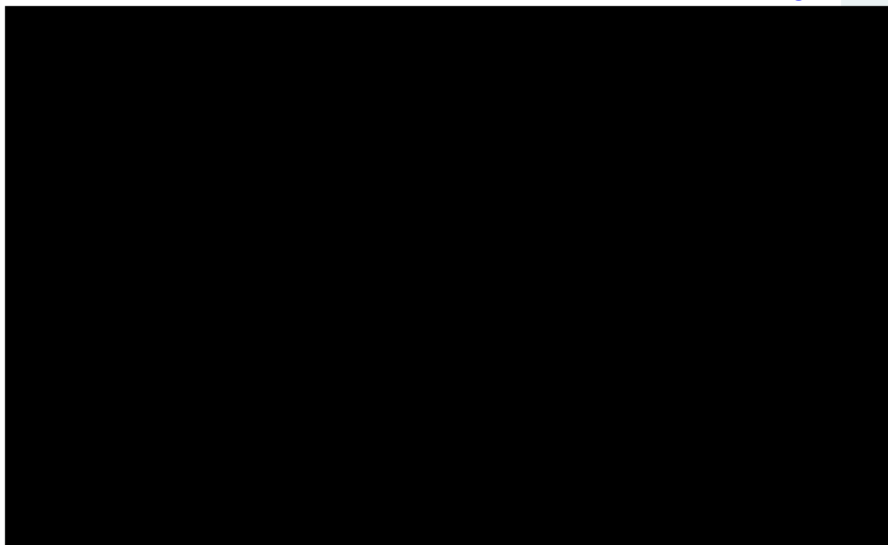[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
79% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 39.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category); 98% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 40.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
79% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 42.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
79% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 44.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
88% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 45.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 95% (for the corresponding app category); 82% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 47.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 49.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 82% (for the corresponding app category);
91% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 50.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
87% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 51.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
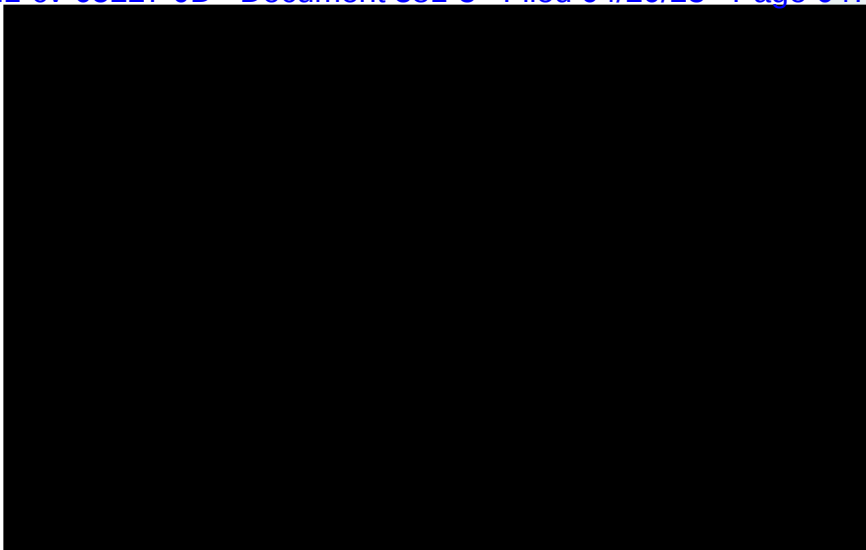85% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 52.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
73% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 55.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
88% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 57.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
53% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 59.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
26% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 60.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
97% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 64.
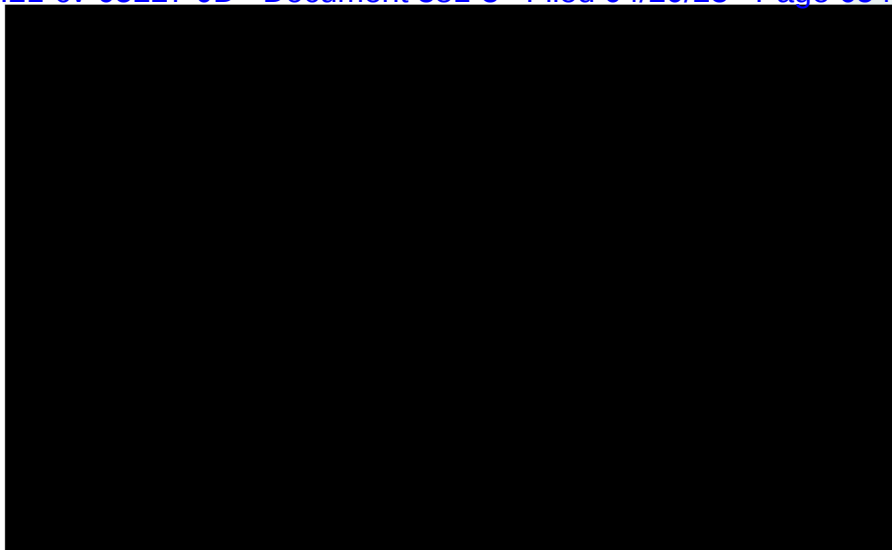[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category); 98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 67.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 68.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
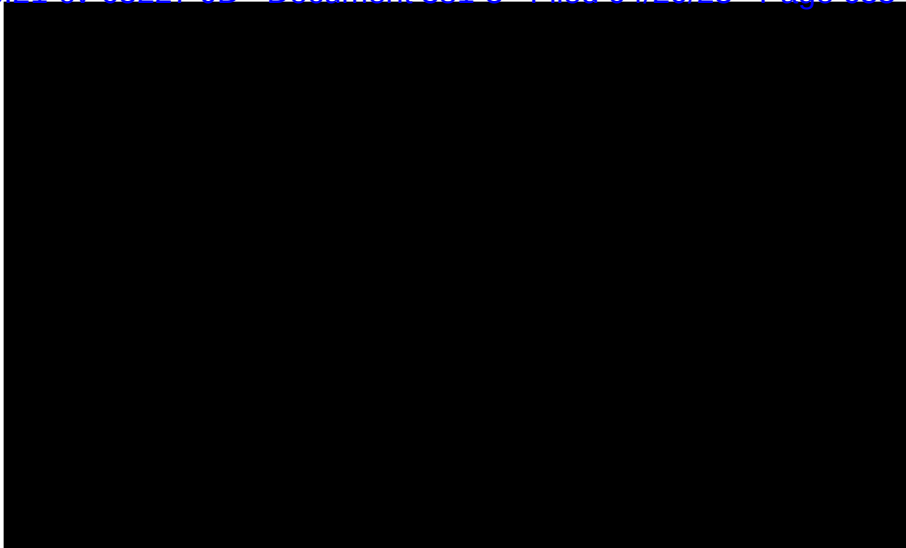79% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 70.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
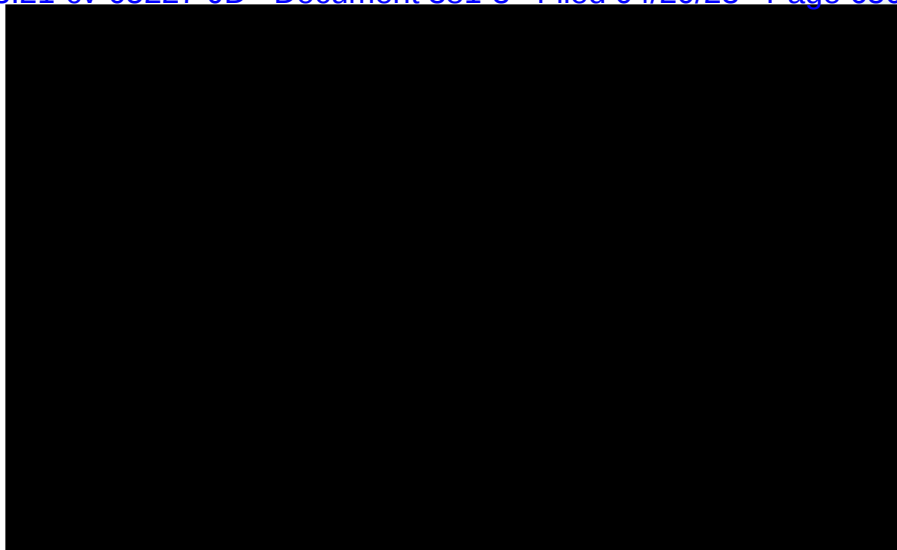88% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 72.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 93% (for the corresponding app category);
88% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 73.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
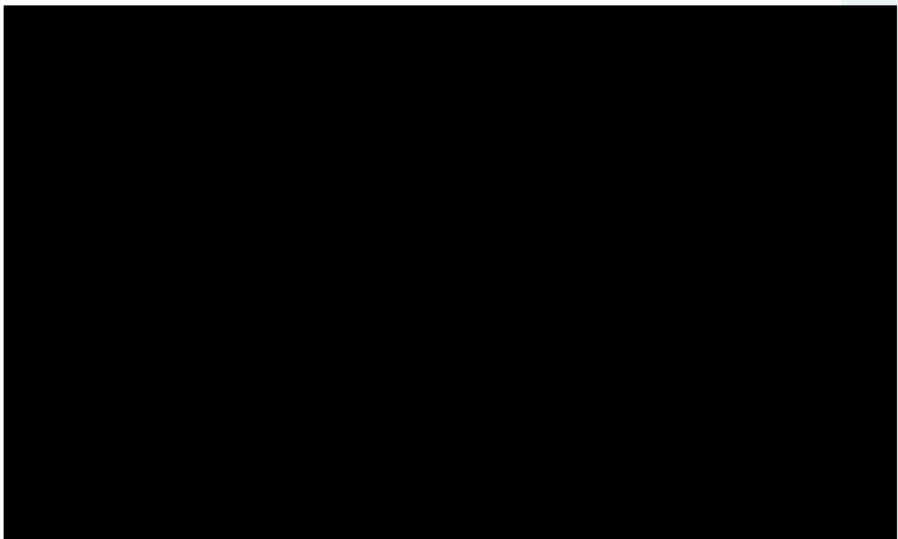96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 75.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category); 26% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 76.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 79% (for the corresponding app category);
90% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 78.
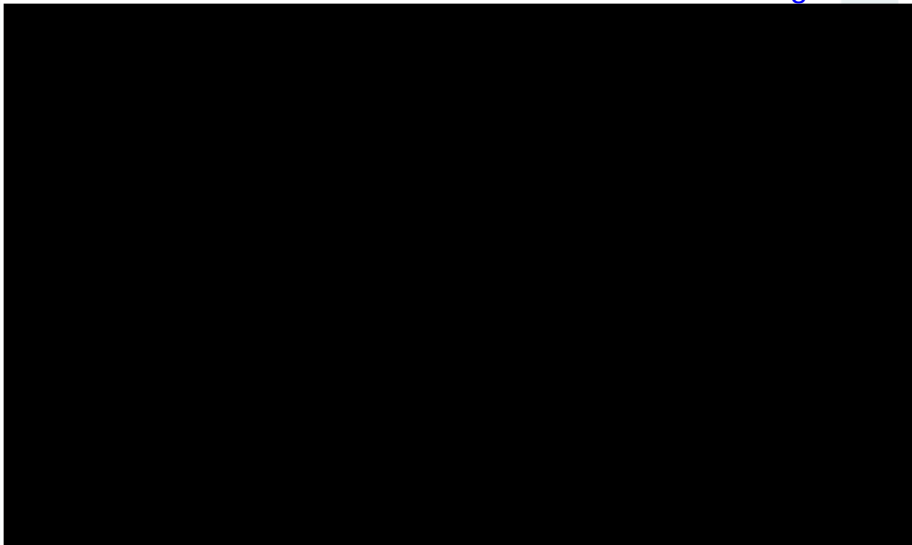[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category); 26% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 79.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
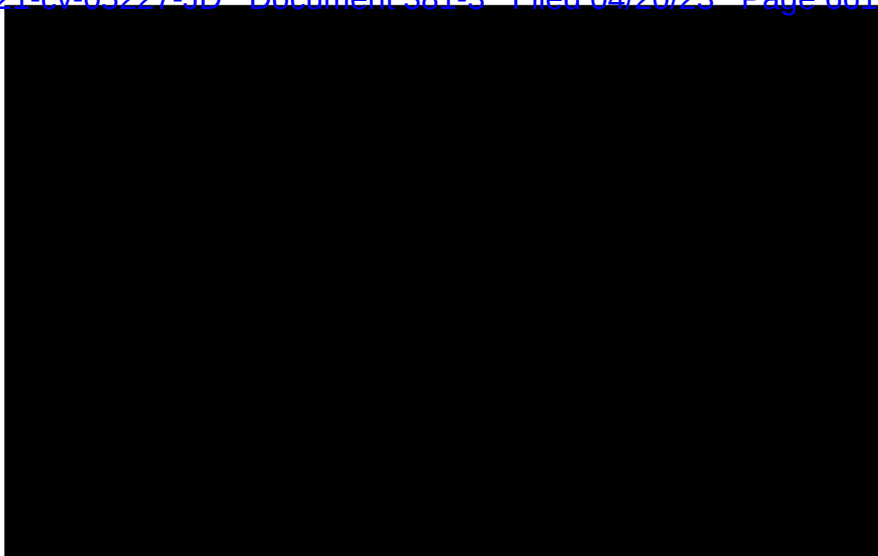90% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 81.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
85% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 82.
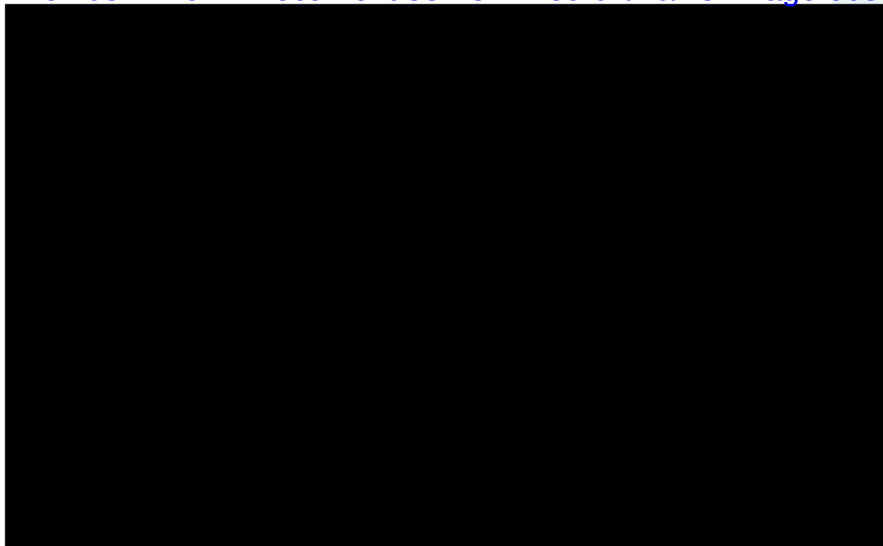[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category); 99% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 83.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
85% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 84.
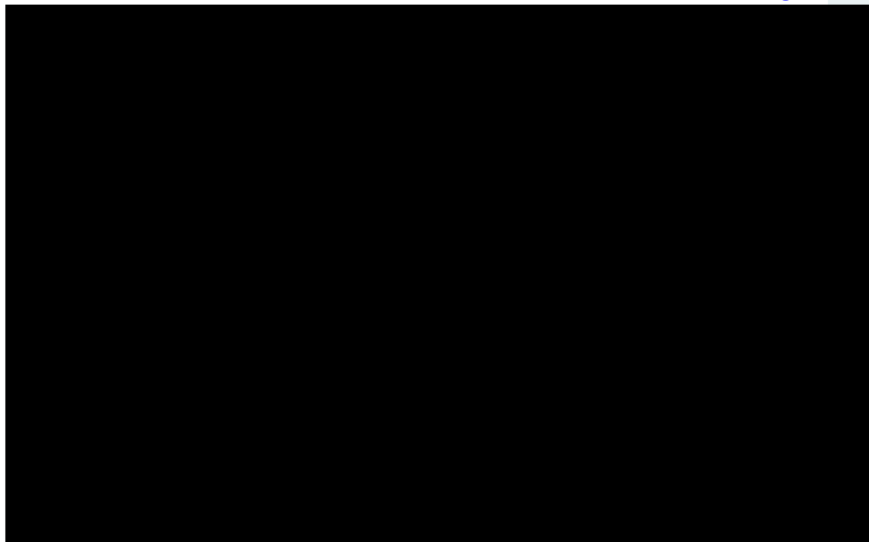[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
96% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 85.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 89.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
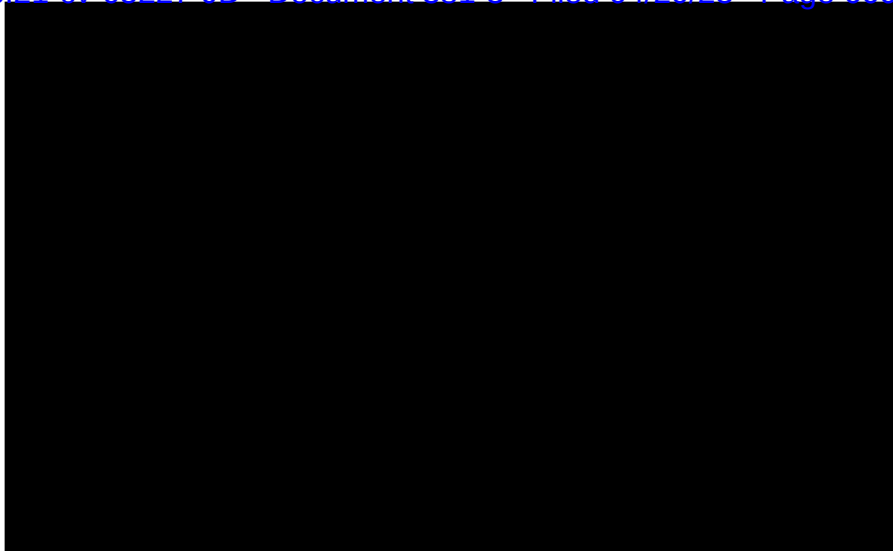90% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 91.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 79% (for the corresponding app category);
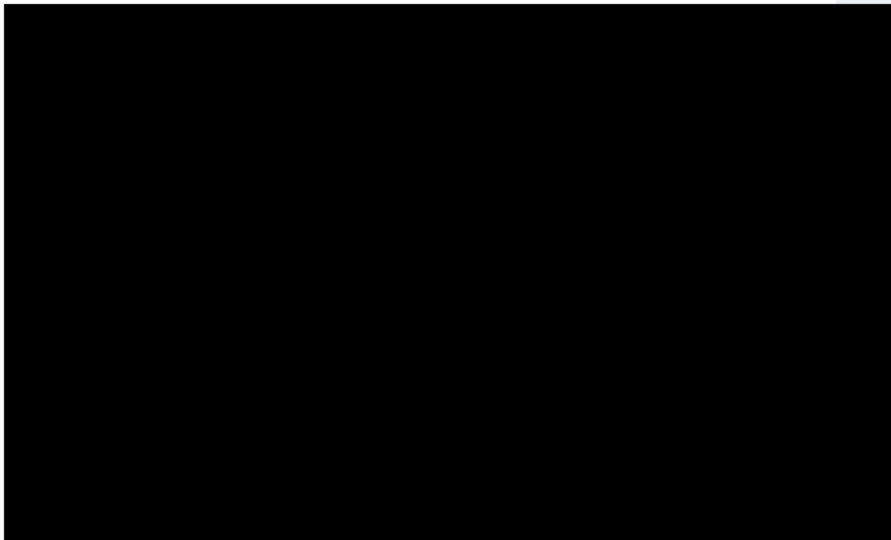93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 92.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category); 96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 93.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
96% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 94.
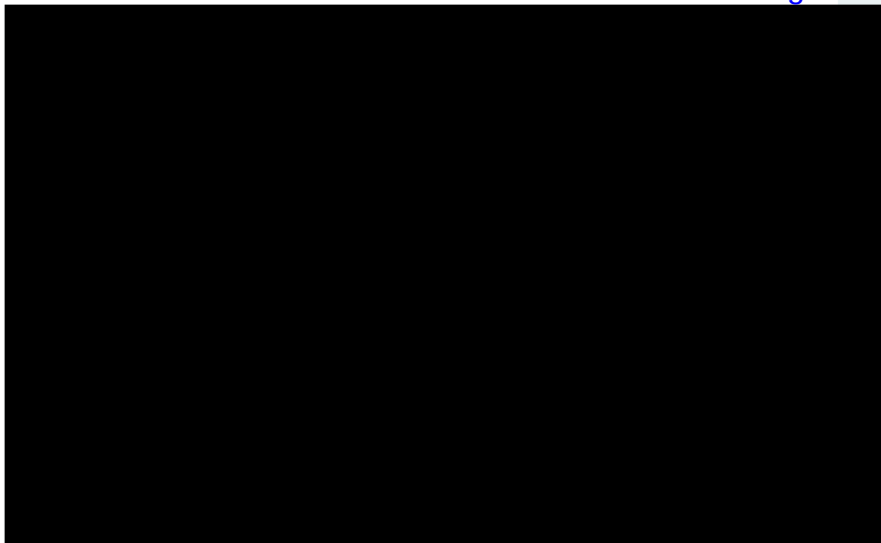[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 98.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
85% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 99.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
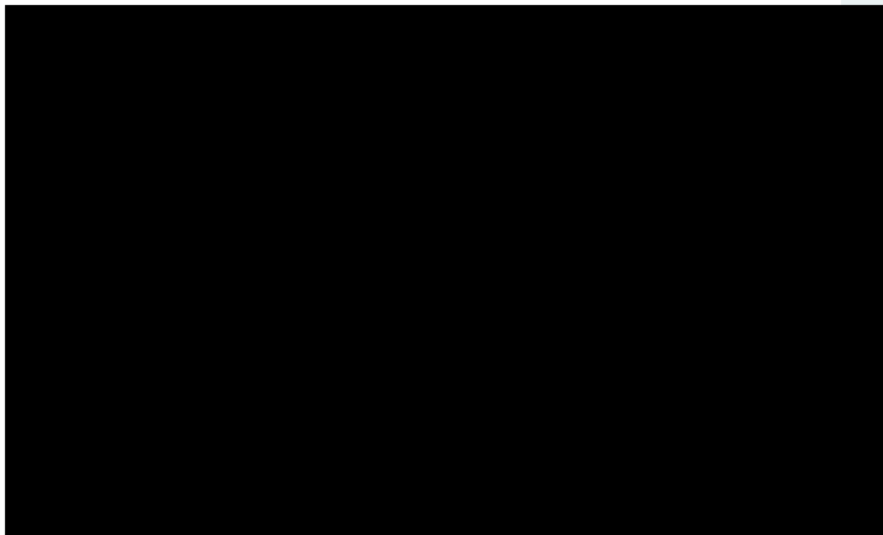97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 1.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category); 60% (for the corresponding app developer).
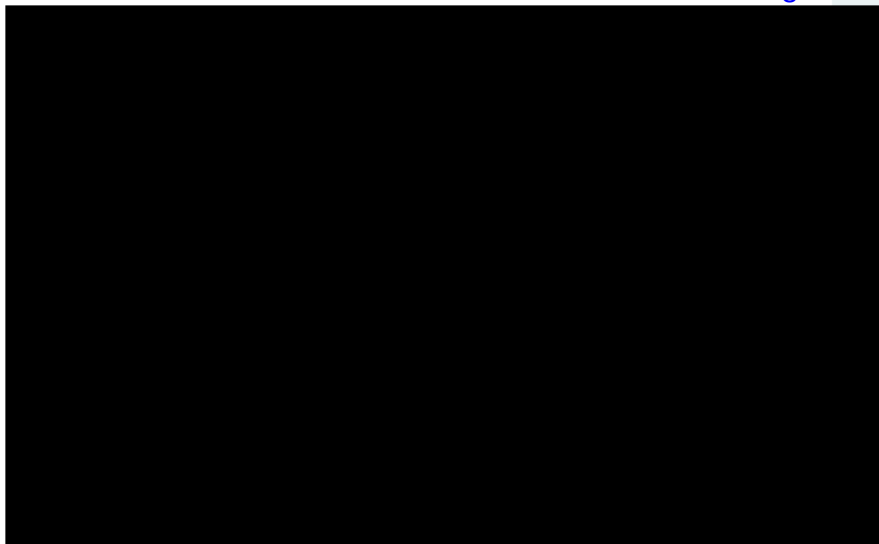
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 2.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
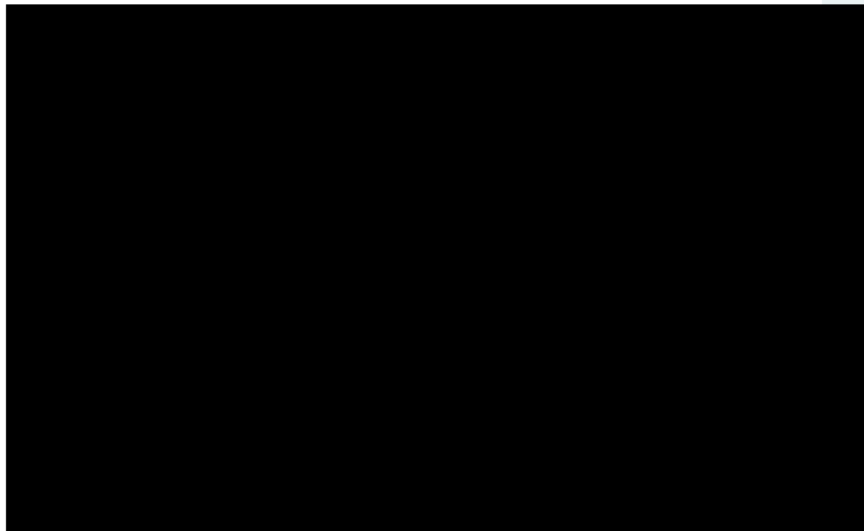88% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 4.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
49% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 17.
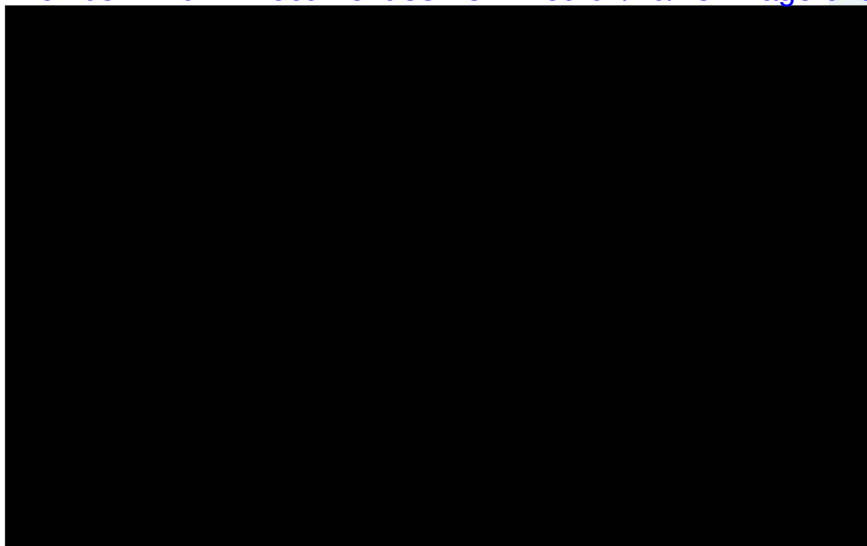[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
79% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 19.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 69% (for the corresponding app category);
55% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 20.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
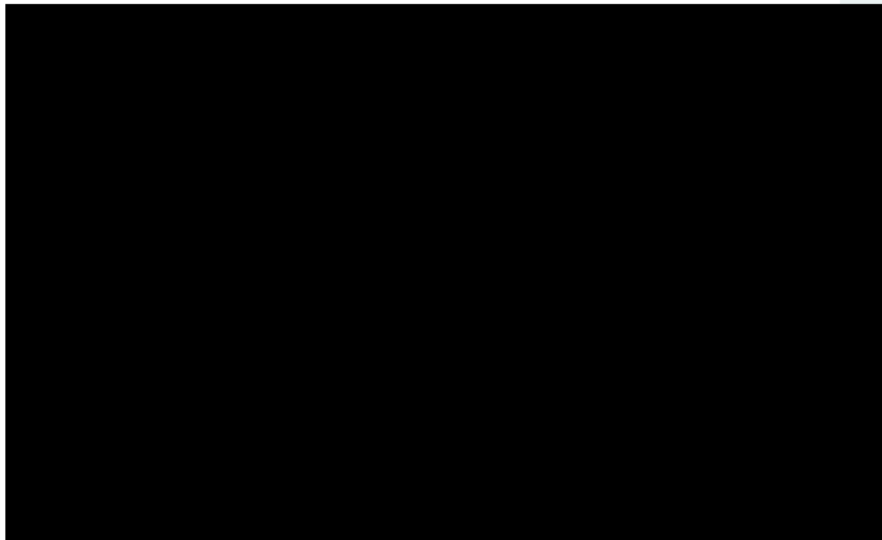89% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 24.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 79% (for the corresponding app category);
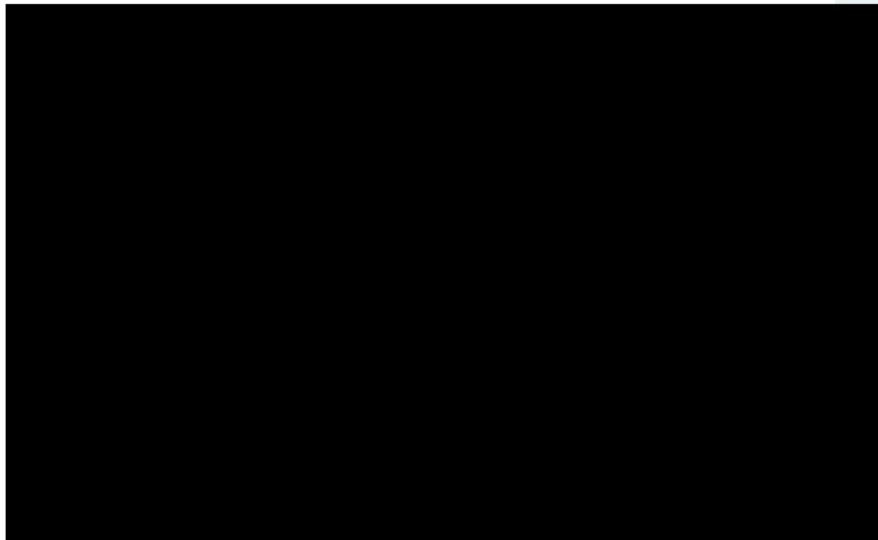93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 26.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 27.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 91% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 30.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
92% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 32.
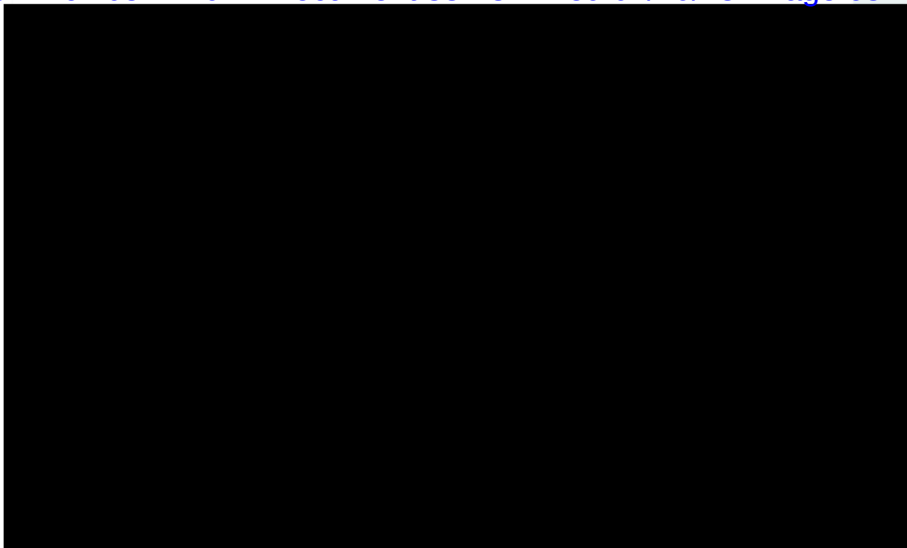[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
89% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 36.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 41.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 95% (for the corresponding app category);
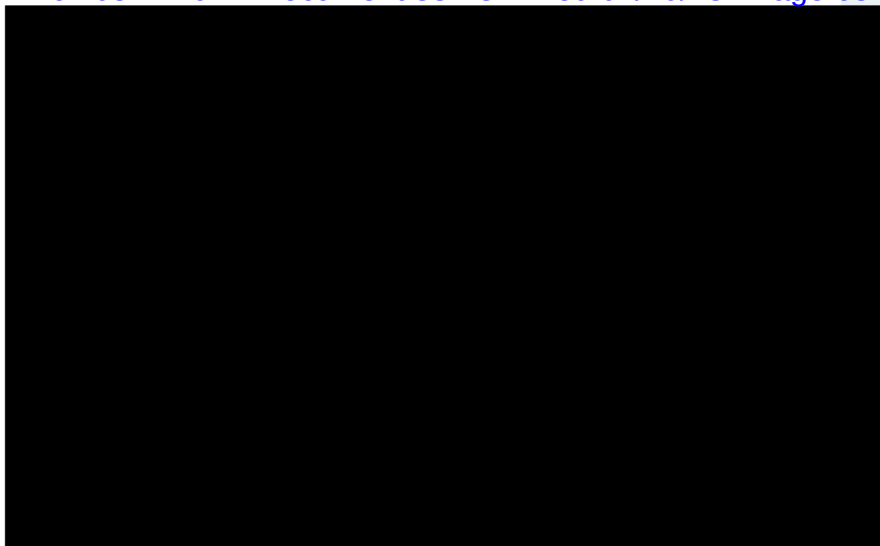88% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 43.
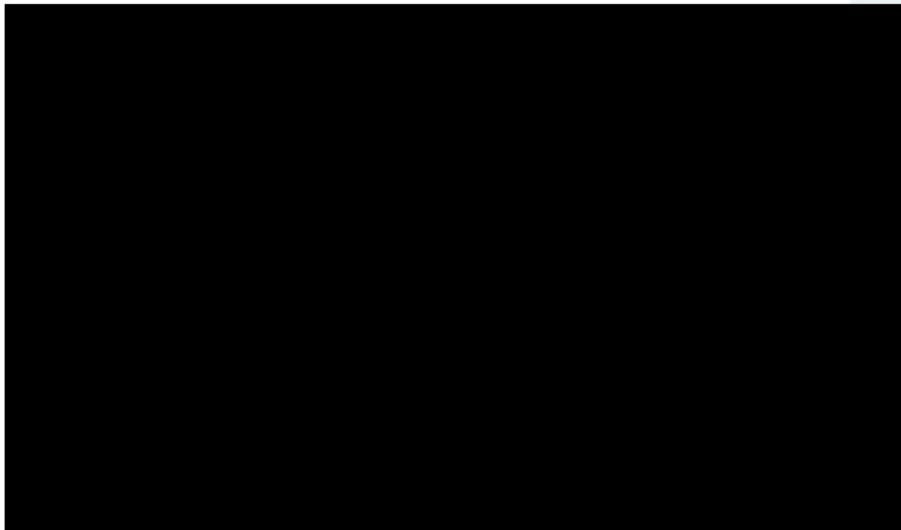[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
26% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 48.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 53.
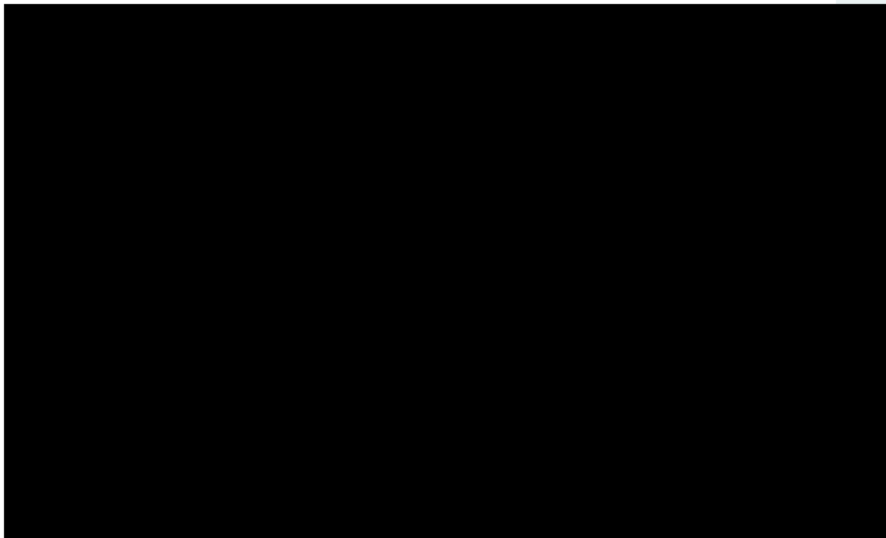[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
49% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 54.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
89% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 58.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 63.
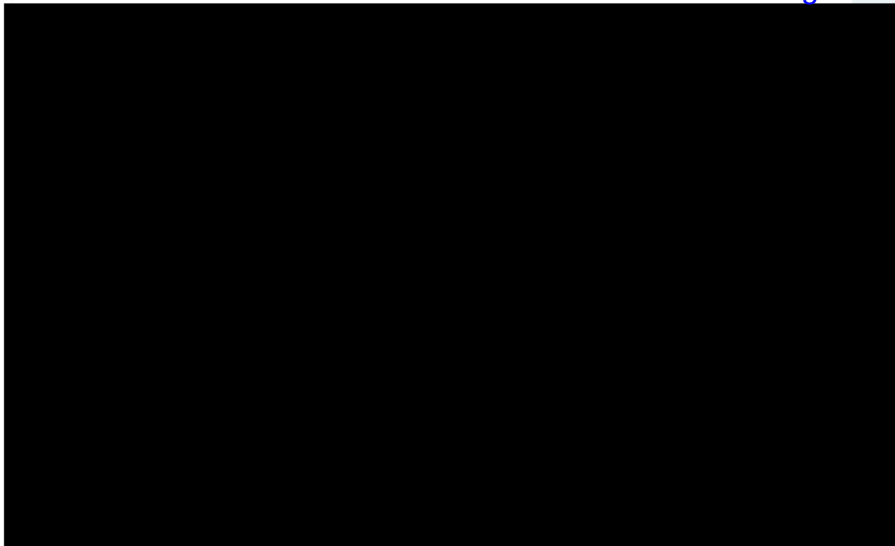[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 65.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 91% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 66.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
99% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 71.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
49% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 74.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
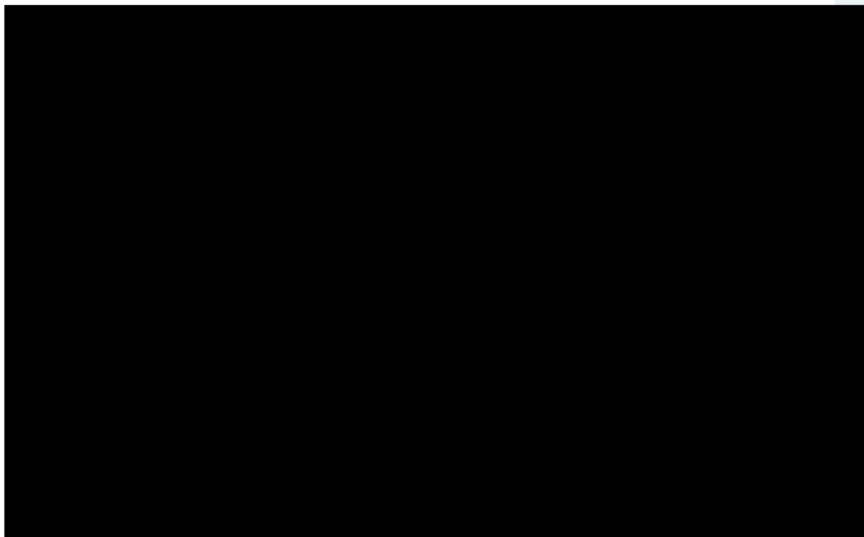[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 77.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
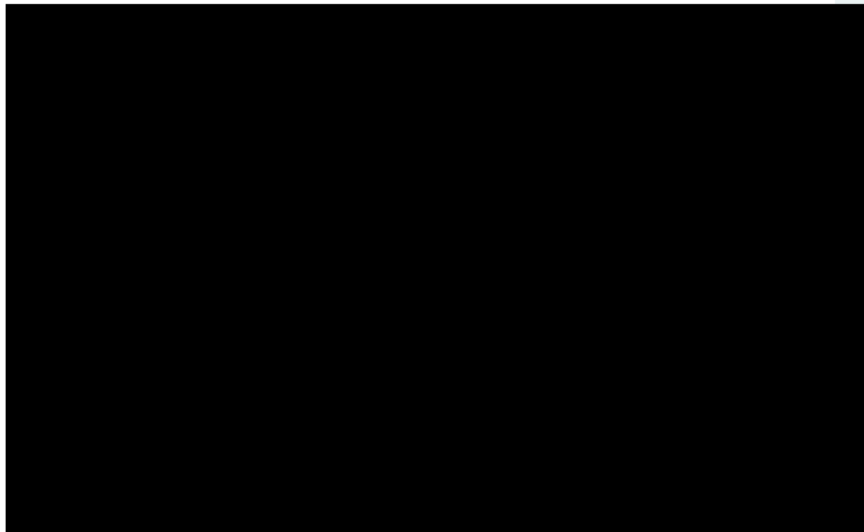98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 80.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
85% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 86.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
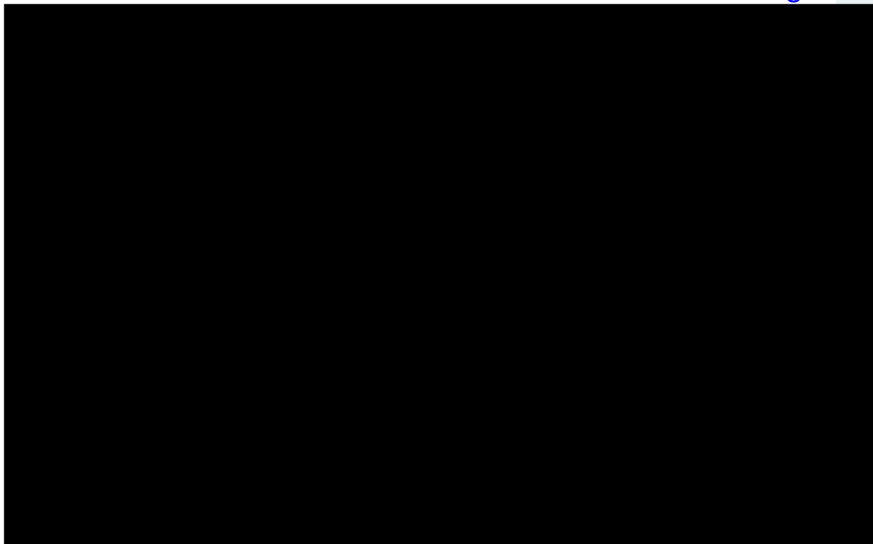89% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 87.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category); 95% (for the corresponding app developer).
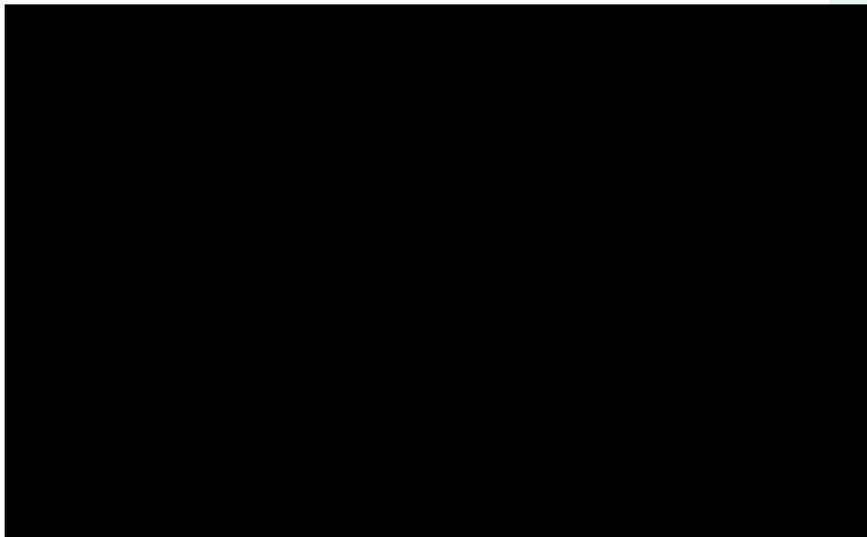
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 88.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
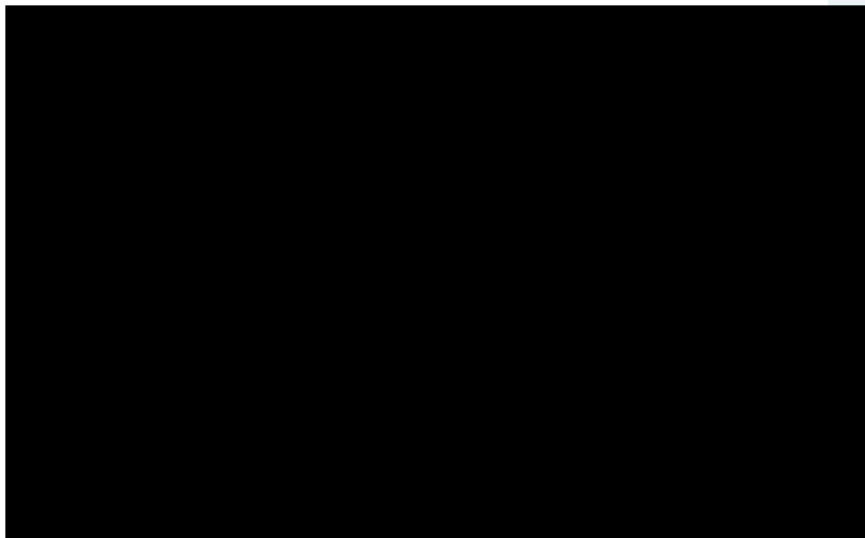80% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 90.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 68% (for the corresponding app category);
92% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 96.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
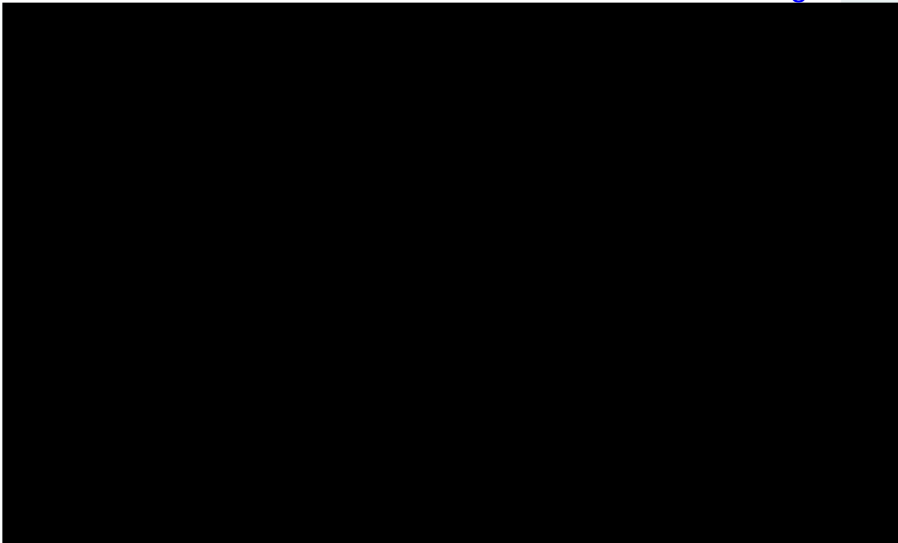87% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 97.
[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category); 93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 100.
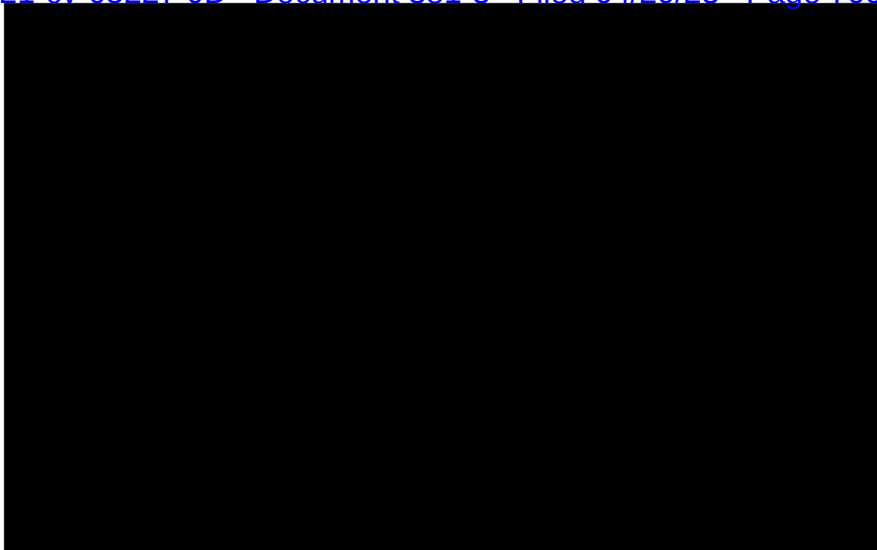[2] Price change before and after July 2021: increase in the list price, increase in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
94% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 5.
[2] Price change before and after July 2021: decrease in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
74% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 14.
[2] Price change before and after July 2021: decrease in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
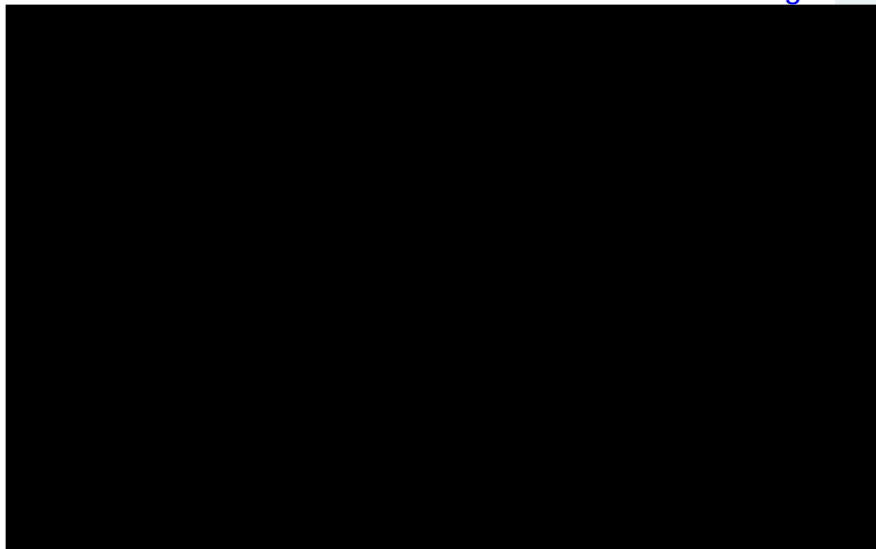49% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 15.
[2] Price change before and after July 2021: decrease in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
89% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 29.
[2] Price change before and after July 2021: decrease in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
87% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 31.
[2] Price change before and after July 2021: decrease in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
96% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 37.
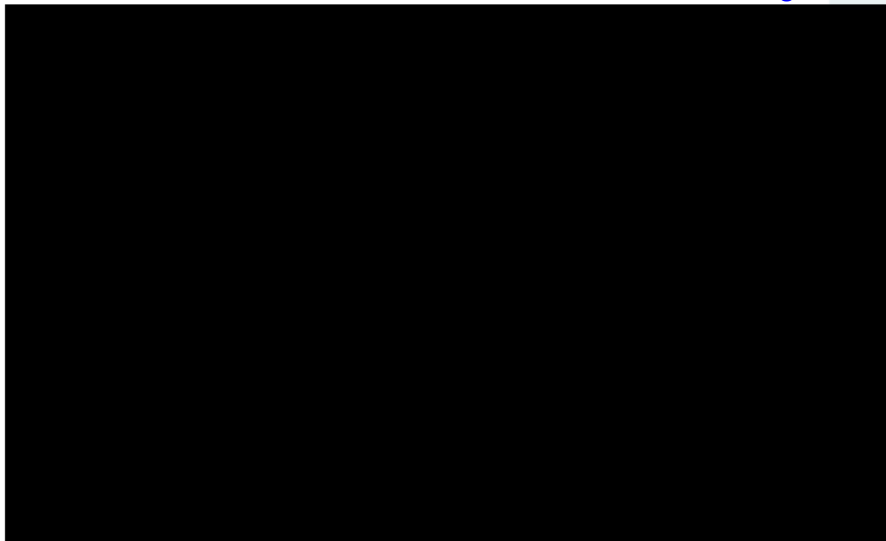[2] Price change before and after July 2021: decrease in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 91% (for the corresponding app category); 96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 46.
[2] Price change before and after July 2021: decrease in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
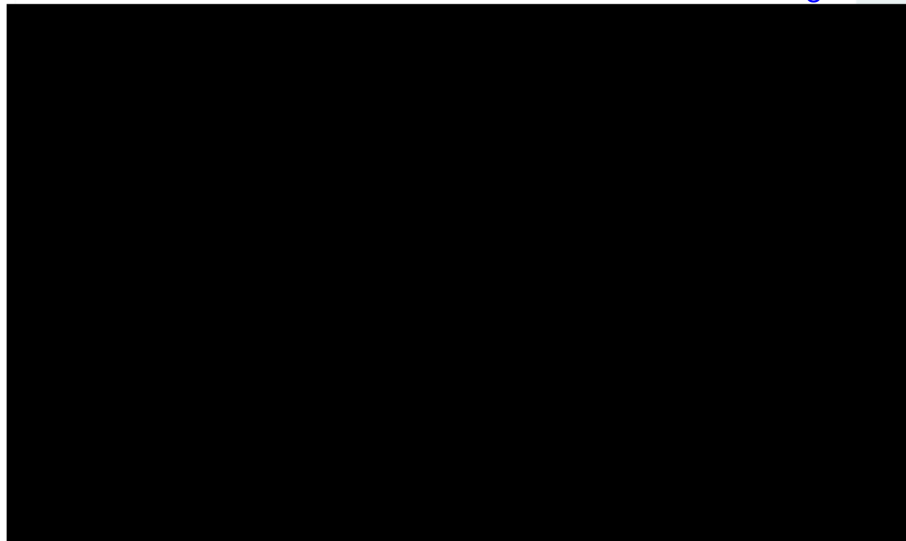96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 56.
[2] Price change before and after July 2021: decrease in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 61.
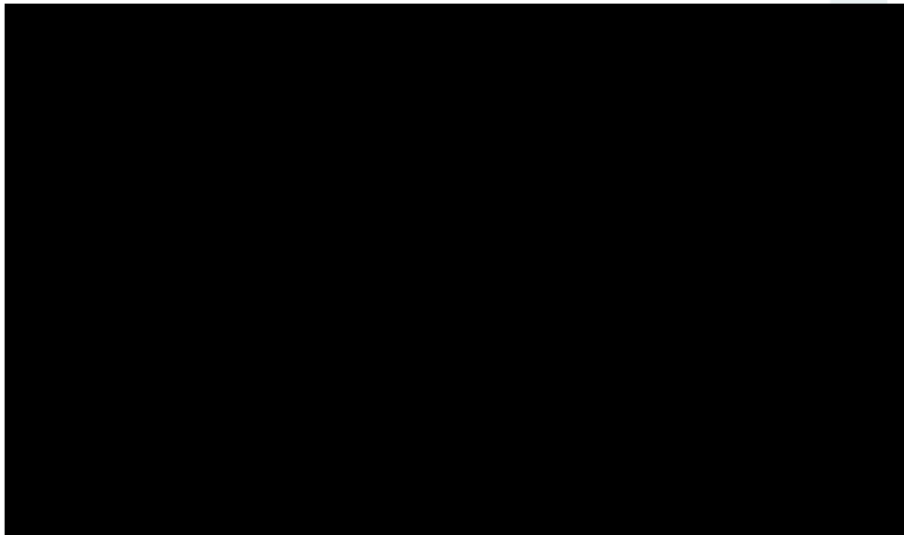[2] Price change before and after July 2021: decrease in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
94% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 62.
[2] Price change before and after July 2021: decrease in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
97% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 69.
[2] Price change before and after July 2021: decrease in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
71% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 95.
[2] Price change before and after July 2021: decrease in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
96% (for the corresponding app developer).

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Exhibit 36a

Average Monthly Product Price and Service Fee Rate for the Top 100 IAPs

With A Flat Service Fee Rate Reduction of 15 Percentage Points After July 2021

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 2.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category); 100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 3.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 4.
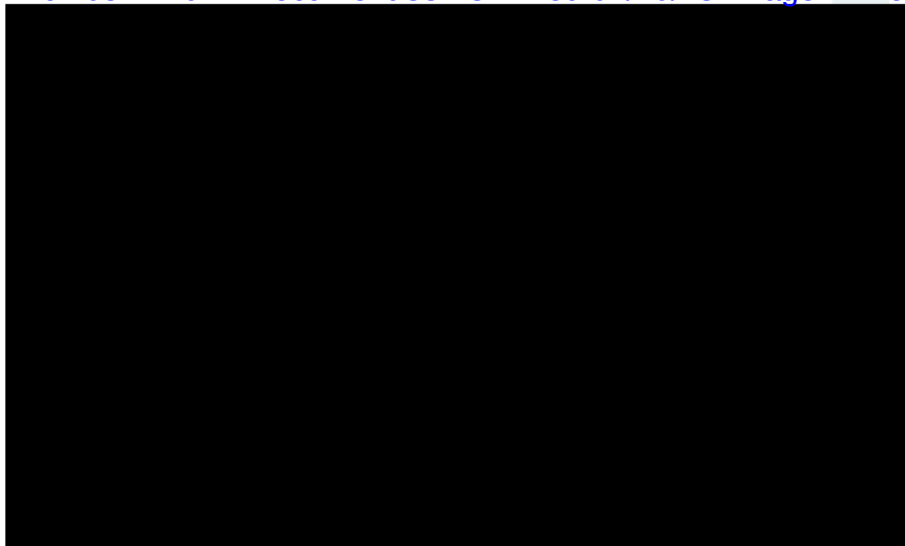[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category); 99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 5.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category); 93% (for the corresponding app developer).
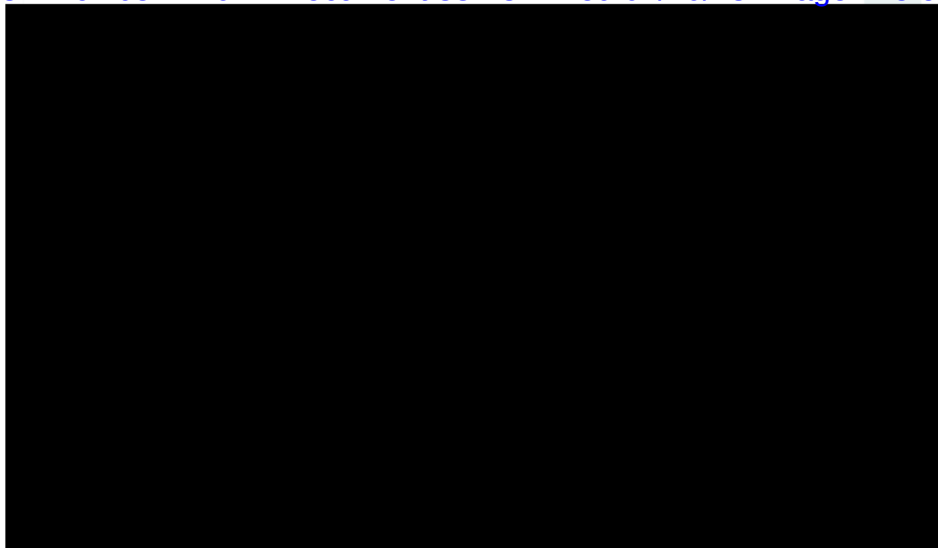
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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 6.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
83% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 7.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 9.
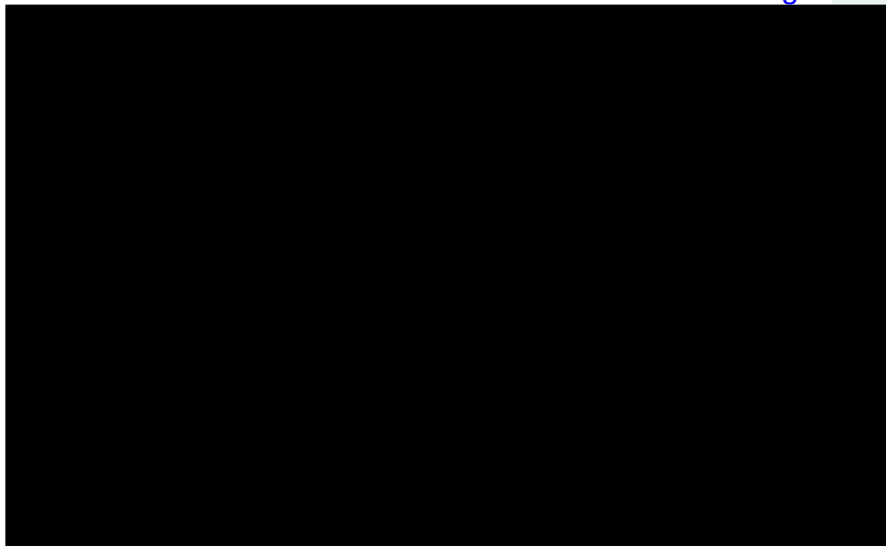[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 10.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
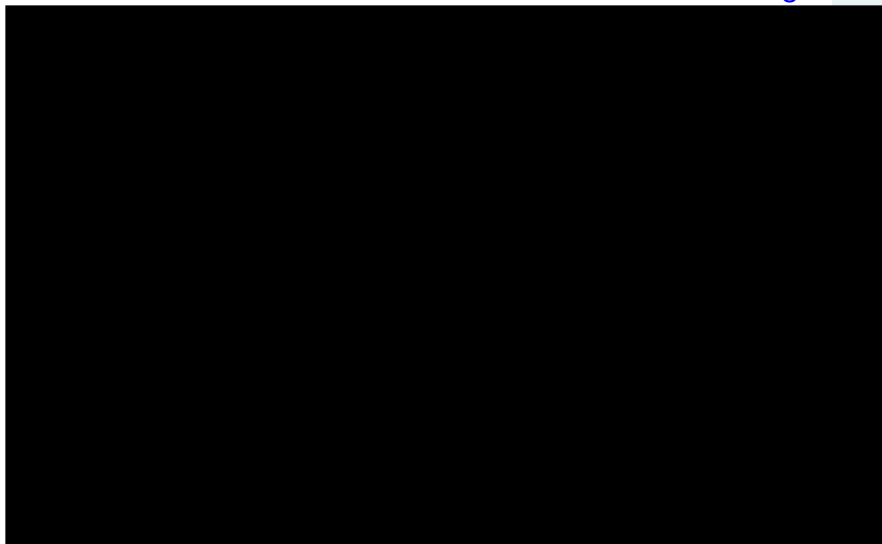100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 11.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
100% (for the corresponding app developer).

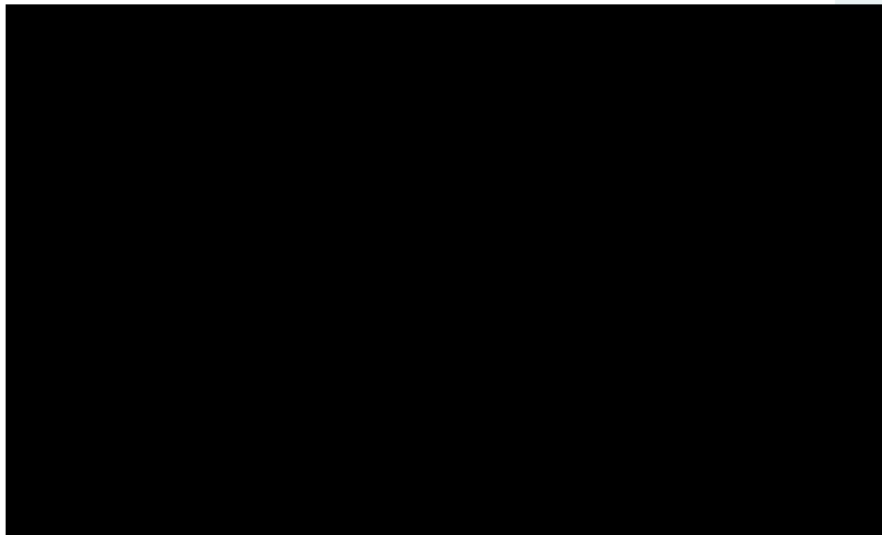Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 12.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
94% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 13.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
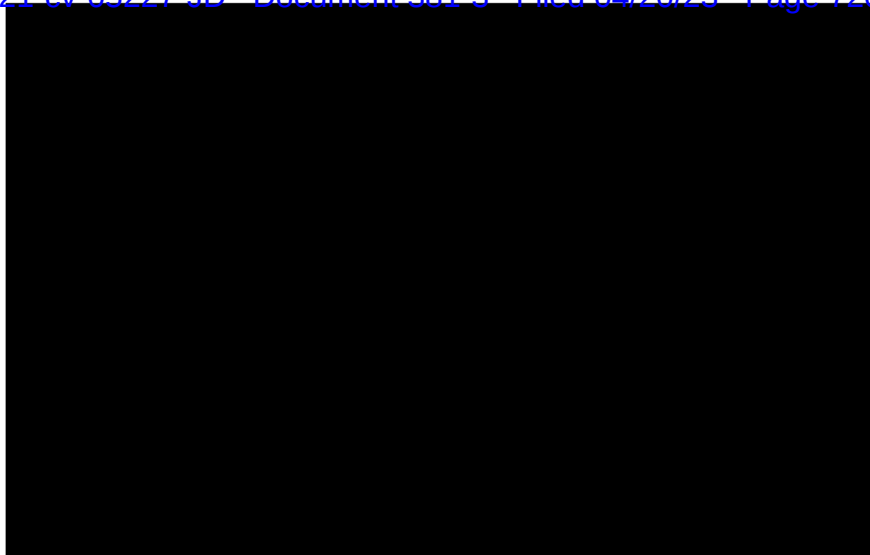100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 14.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
100% (for the corresponding app developer).

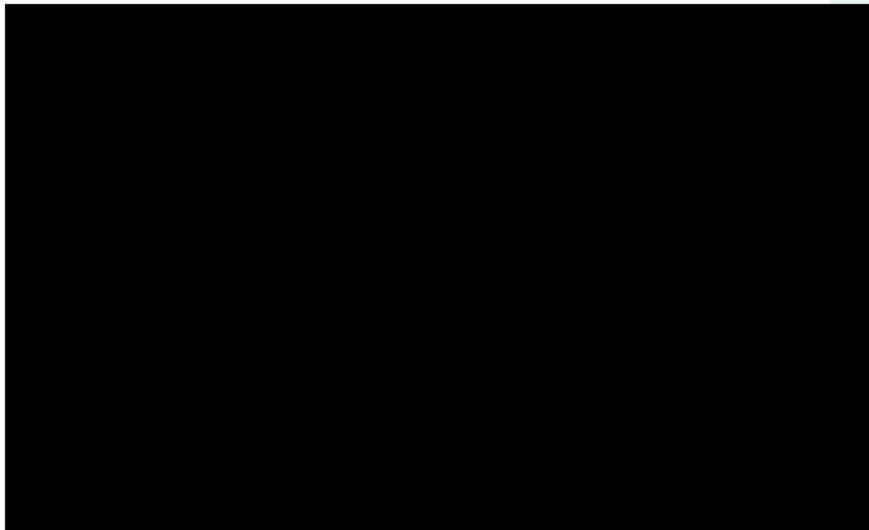Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 15.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 16.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category); 100% (for the corresponding app developer).
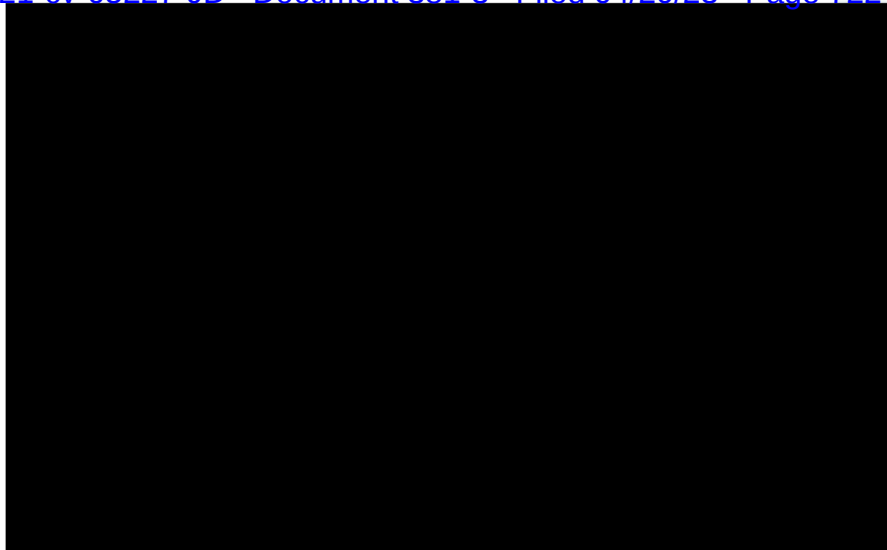
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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 17.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 18.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category); 95% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 19.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 20.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 21.
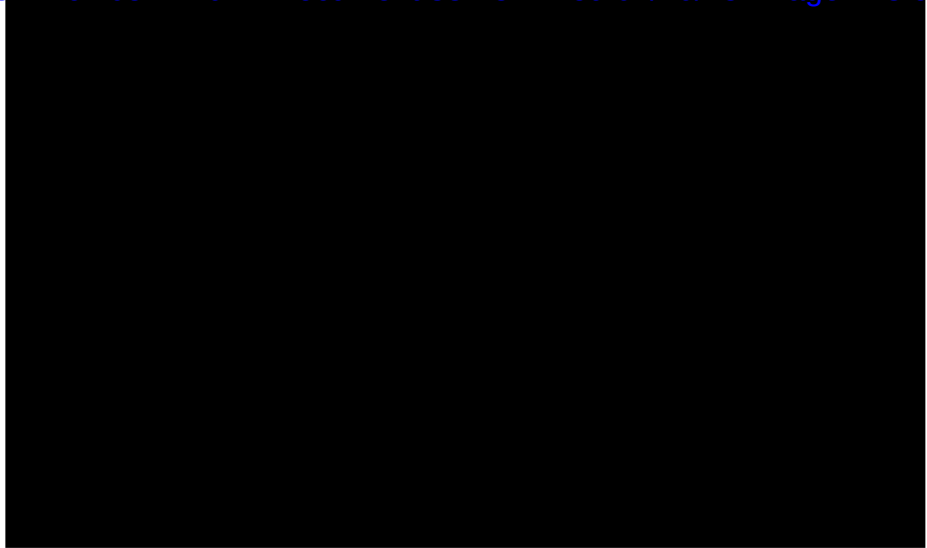[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 22.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
100% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 23.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
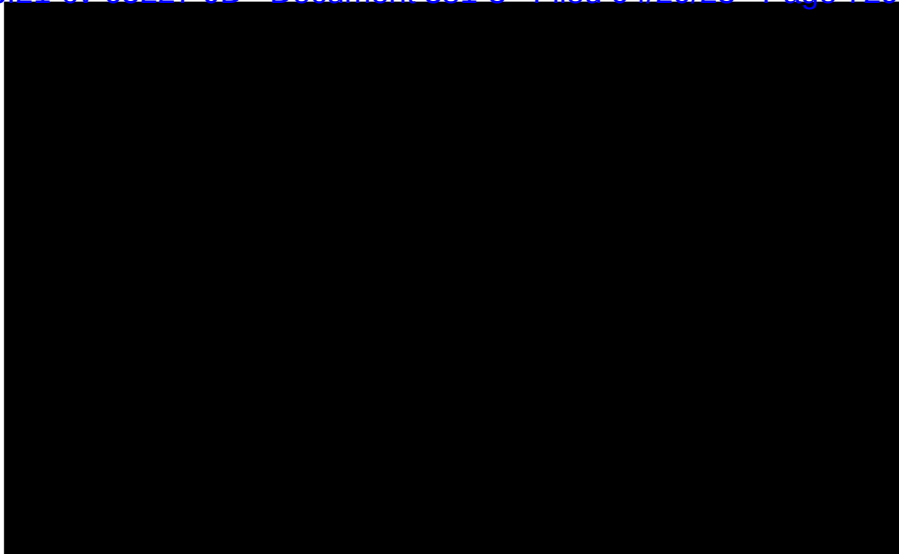100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 24.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
99% (for the corresponding app developer).

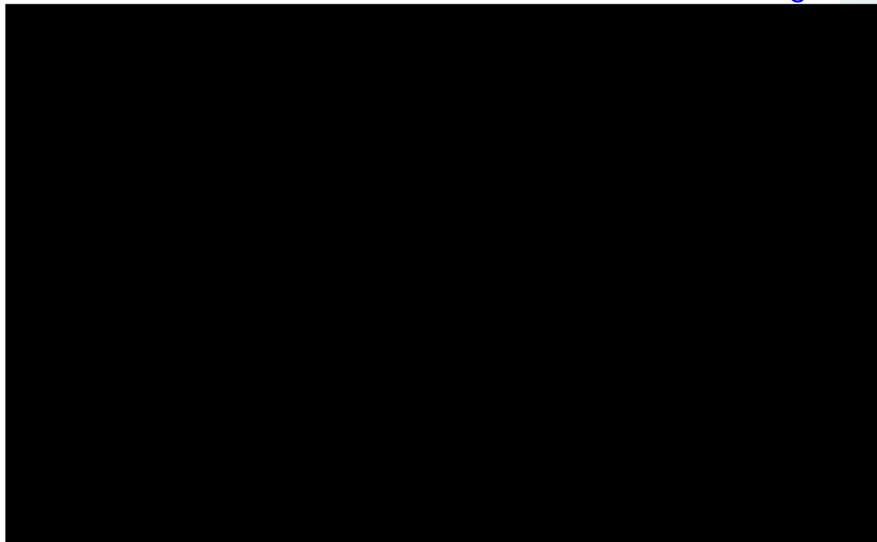Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 25.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
100% (for the corresponding app developer).

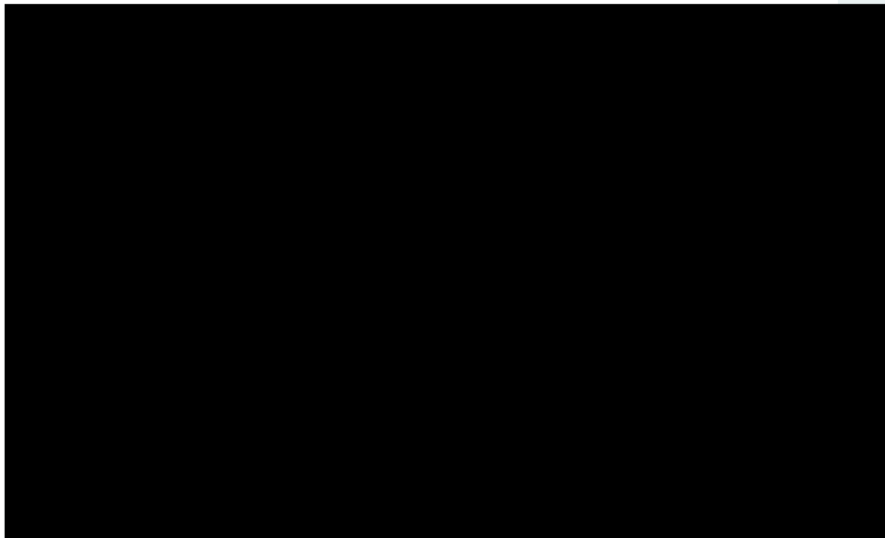Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 26.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).
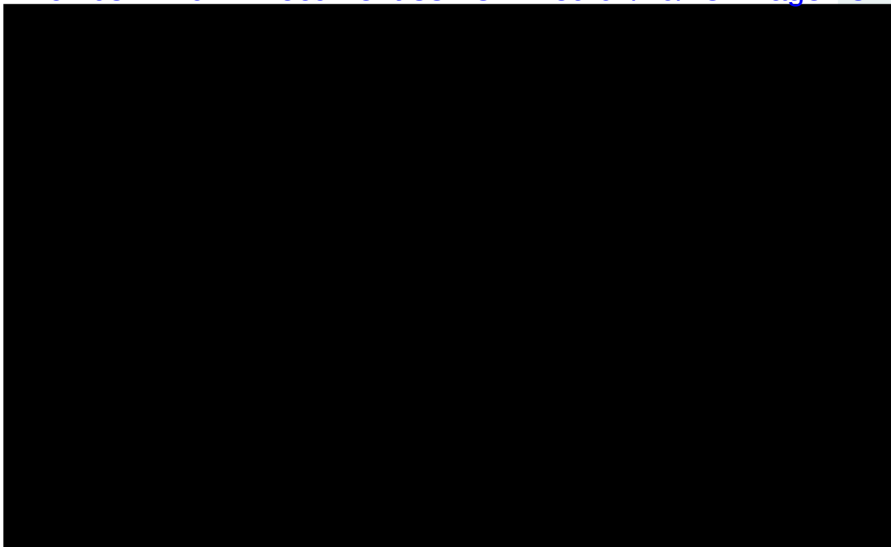
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 27.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 28.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
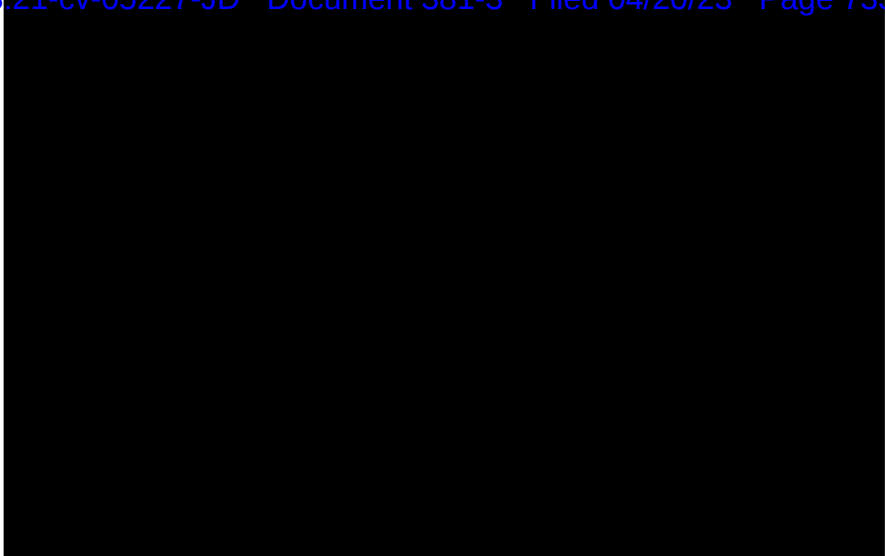99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 29.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 30.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 31.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 32.
[2] Price change before and after July 2021: no change in list price, no change in net price.
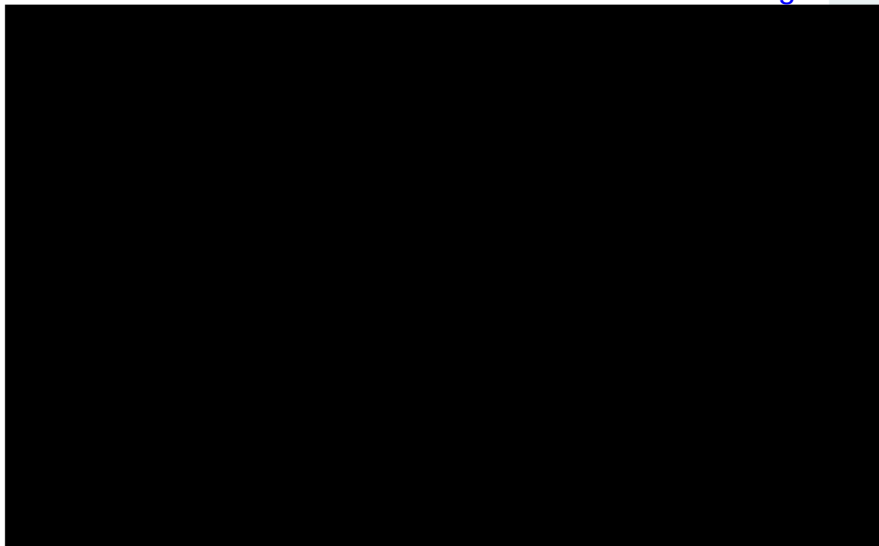[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 33.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 34.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
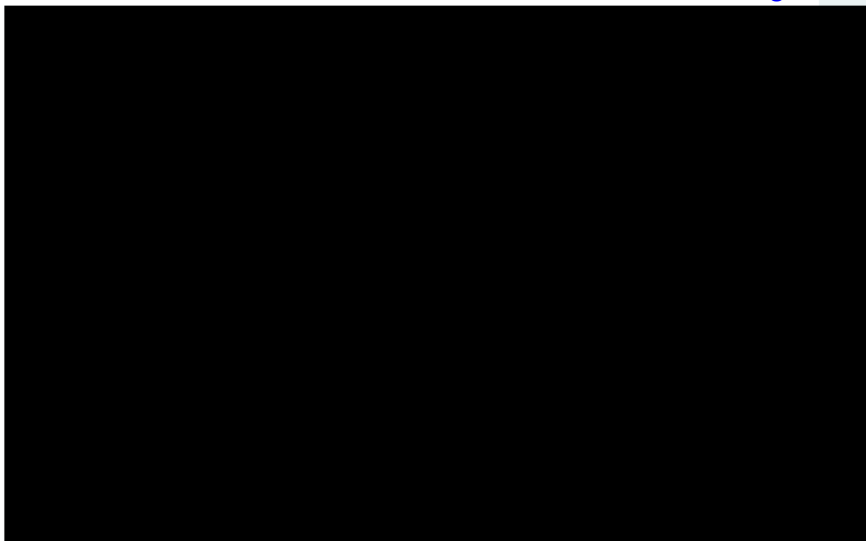100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 35.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
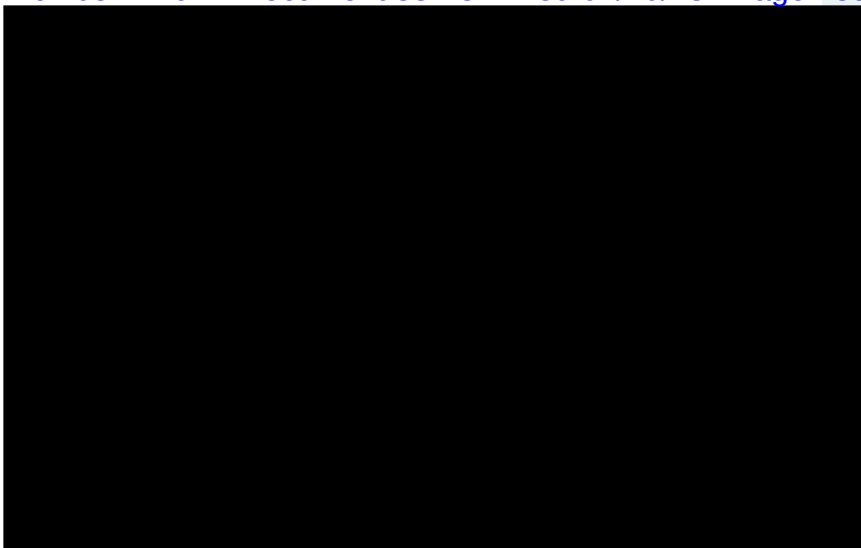100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 36.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 37.
[2] Price change before and after July 2021: no change in list price, no change in net price.
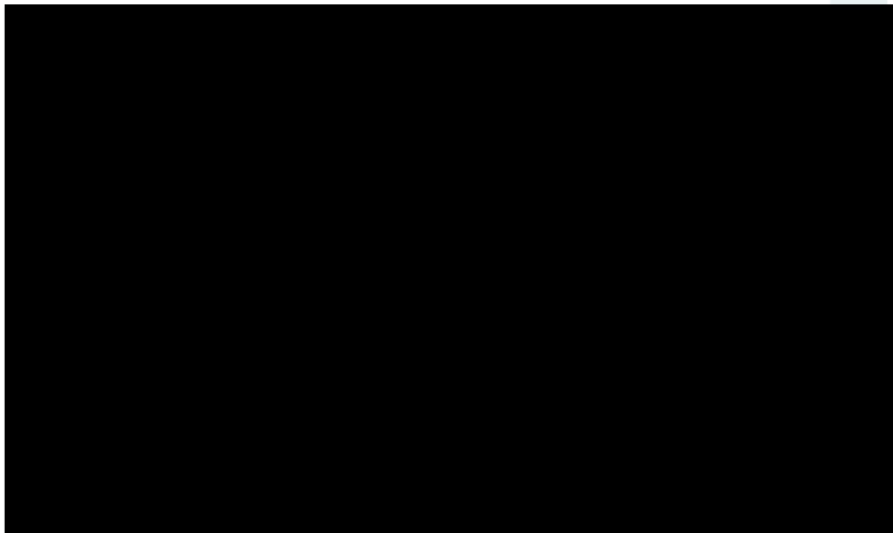[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 38.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 39.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
99% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 41.
[2] Price change before and after July 2021: no change in list price, no change in net price.
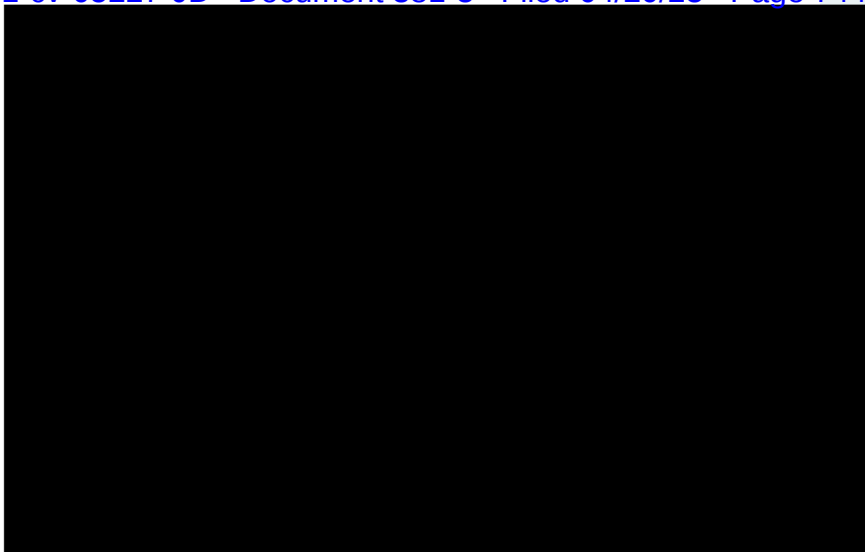[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 42.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 43.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
87% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 44.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
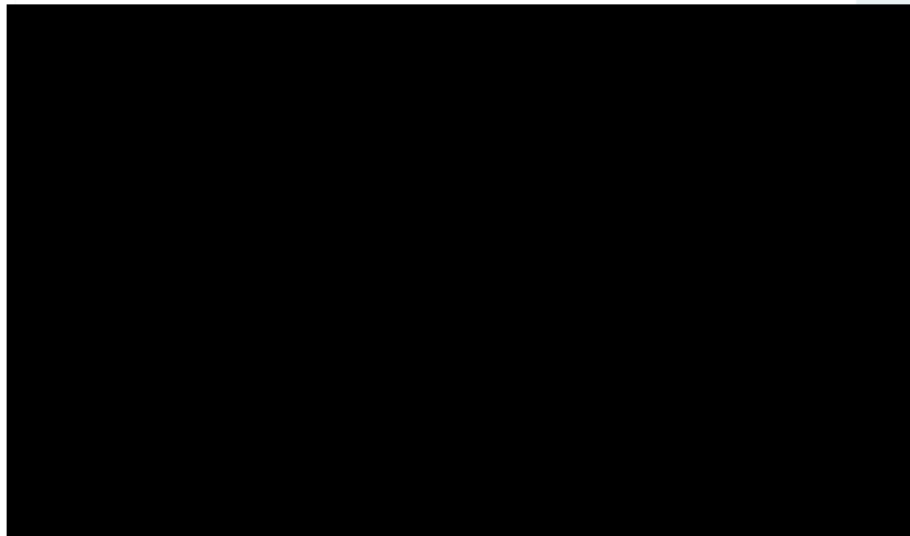100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 45.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 46.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 48.
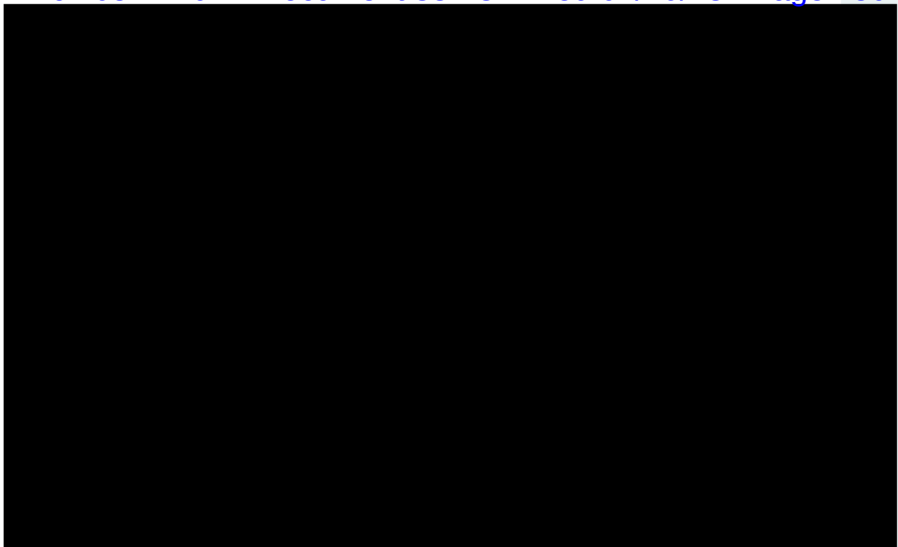[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 49.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

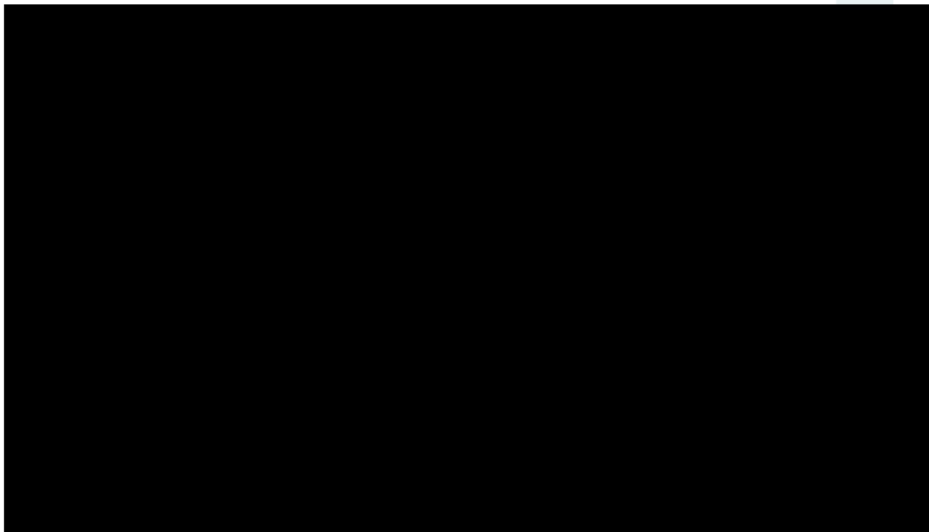Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 50.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
99% (for the corresponding app developer).

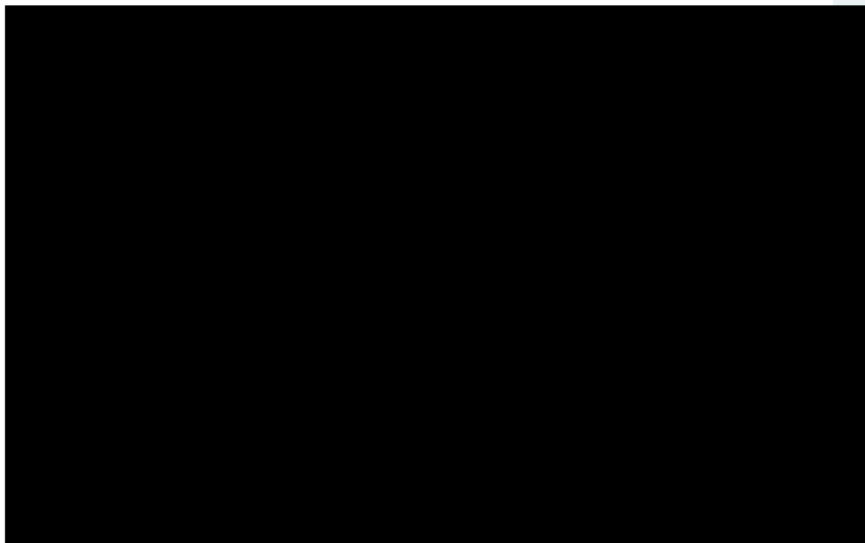Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 51.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 79% (for the corresponding app category);
98% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 52.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
99% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 55.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 95% (for the corresponding app category);
99% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 56.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 57.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 60.
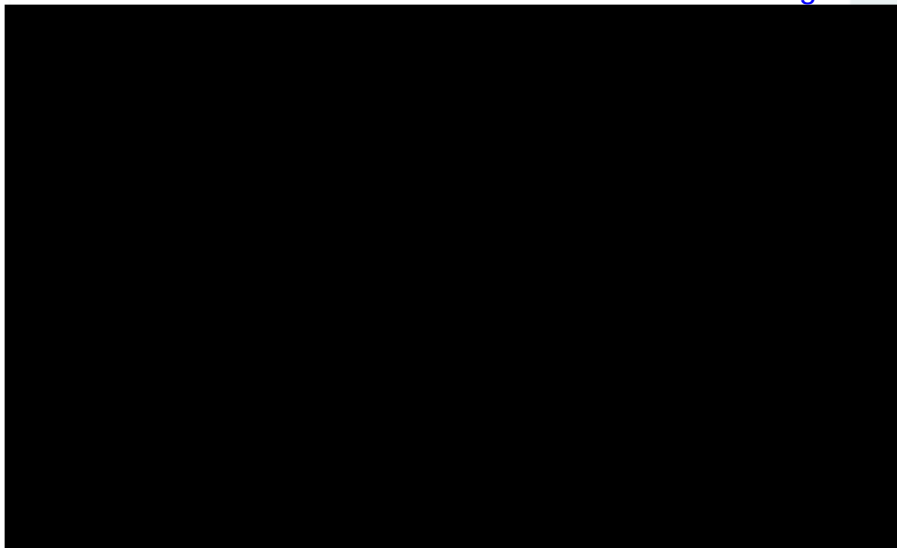[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

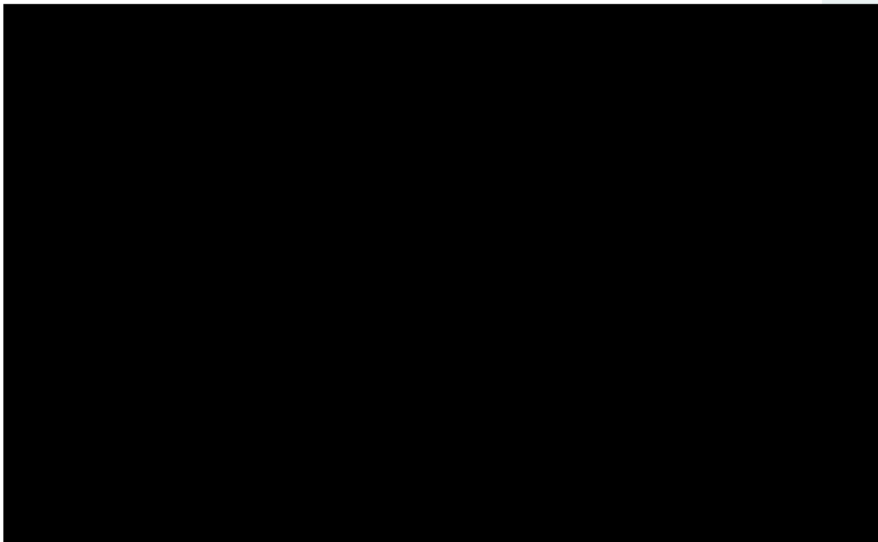Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 61.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 39% (for the corresponding app category);
86% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 63.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
100% (for the corresponding app developer).

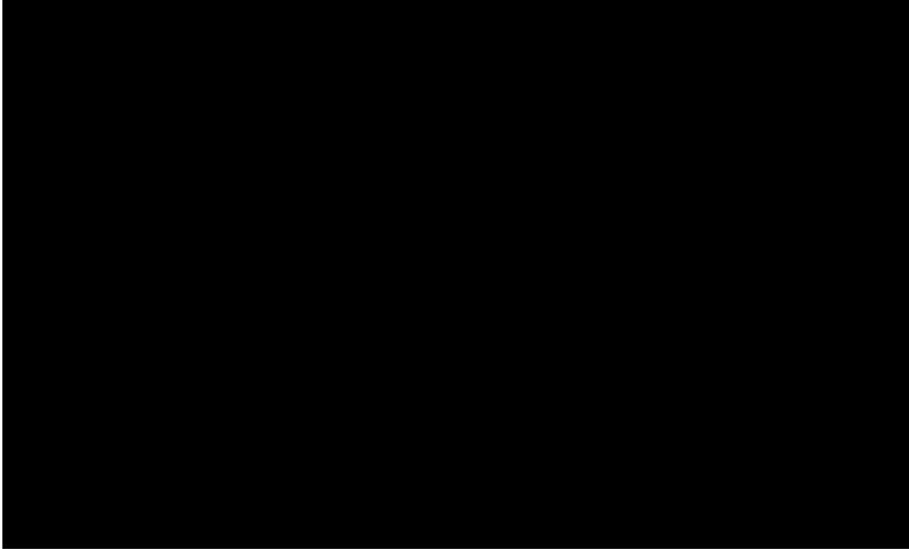Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 65.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category); 99% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 66.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 67.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 68.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 69.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
100% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 70.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 71.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 72.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 75.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
87% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 76.
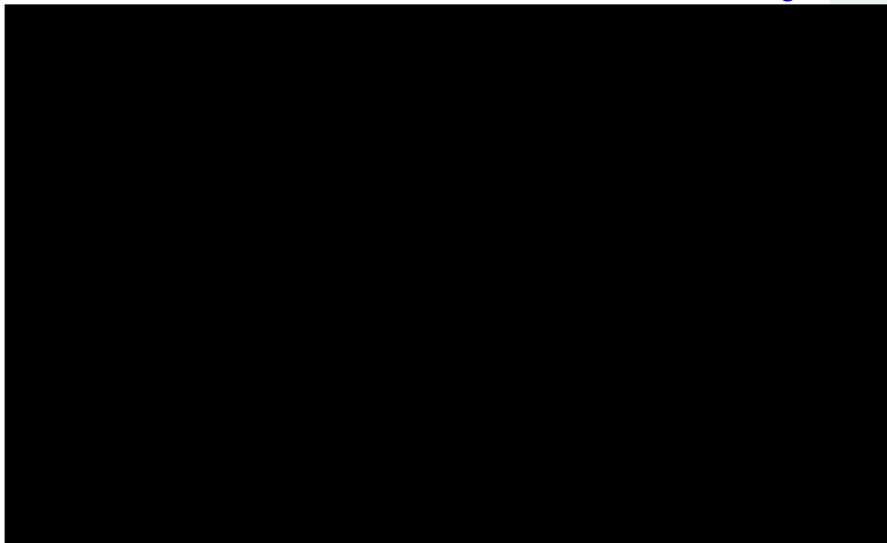[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 77.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 78.
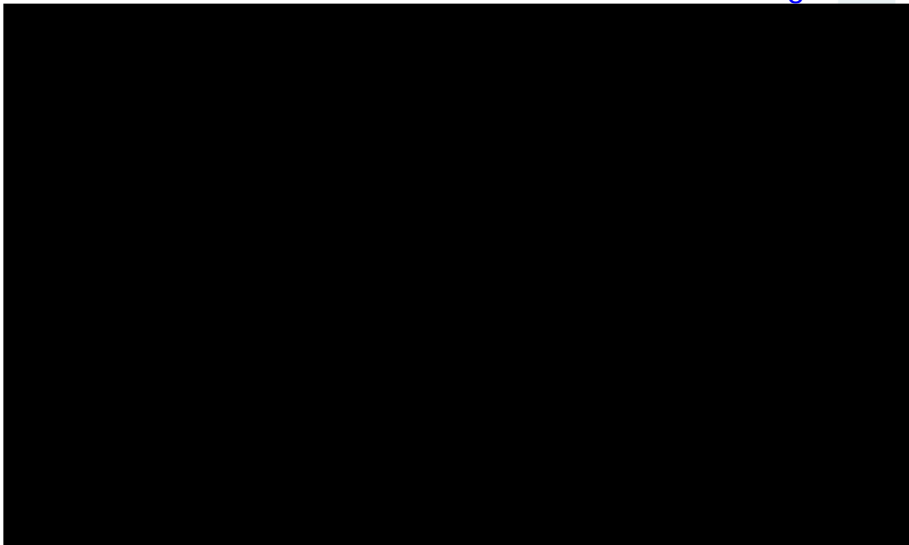[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 80.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
98% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 81.
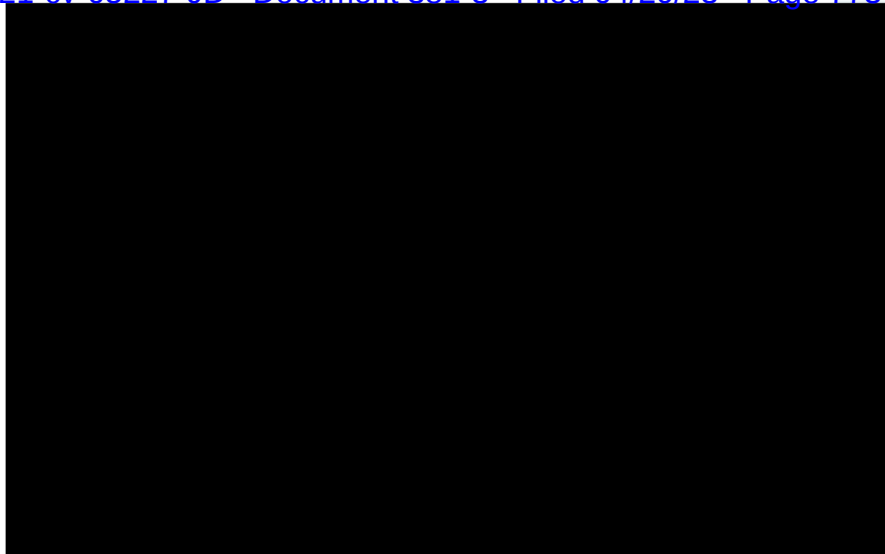[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 82.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
100% (for the corresponding app developer).

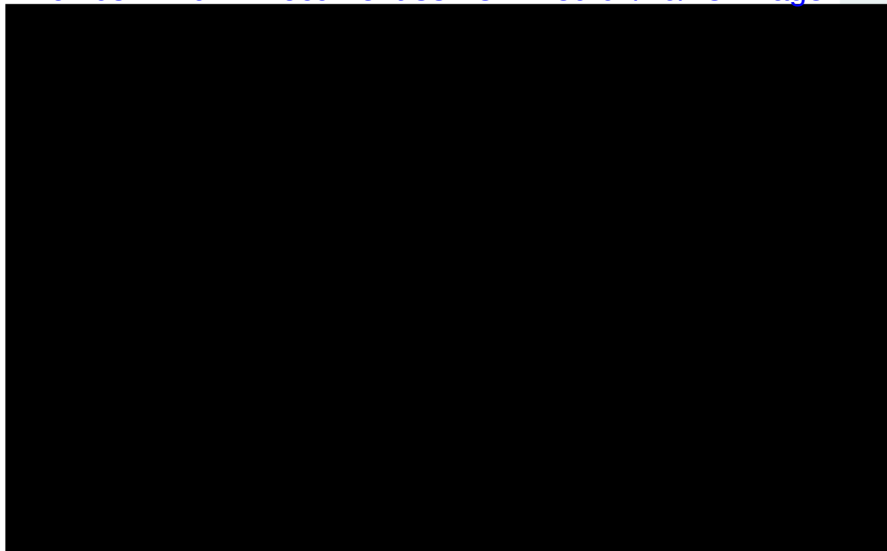Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 84.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 85.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 86.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 87.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 88.
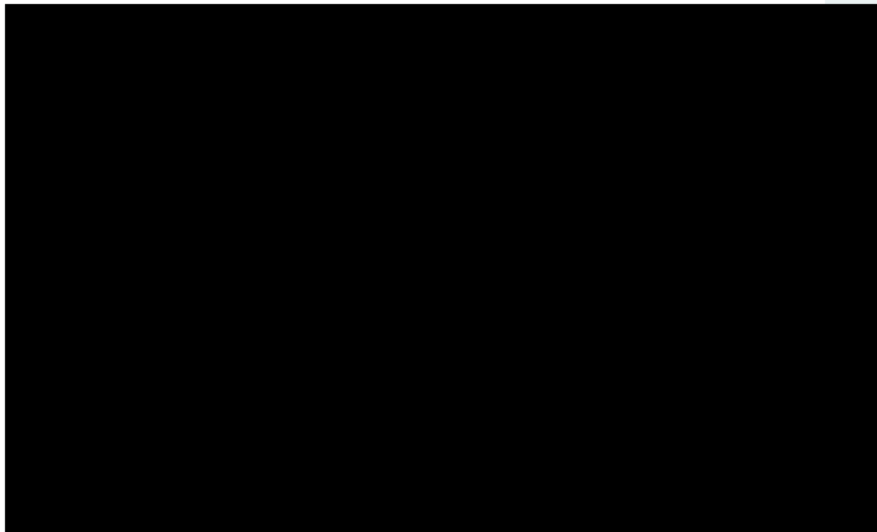[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 89.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 90.
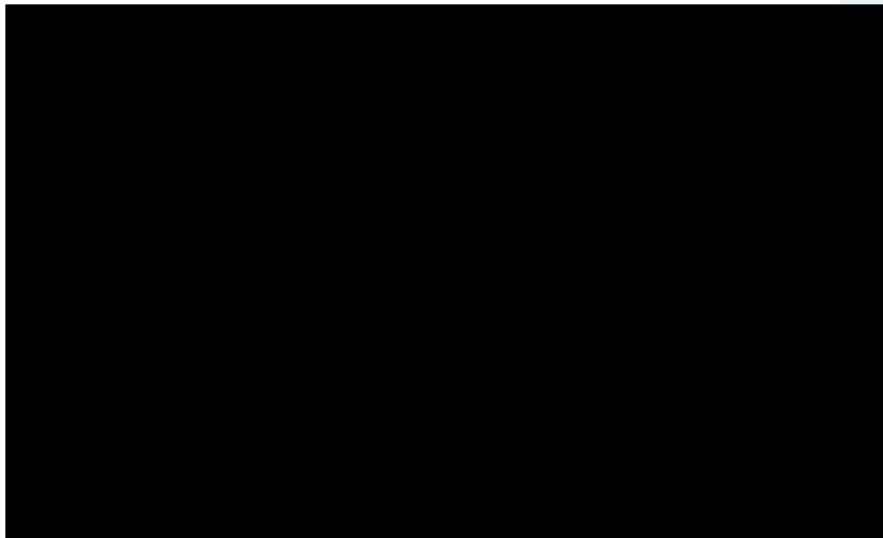[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 79% (for the corresponding app category);
97% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 91.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 92.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 94.
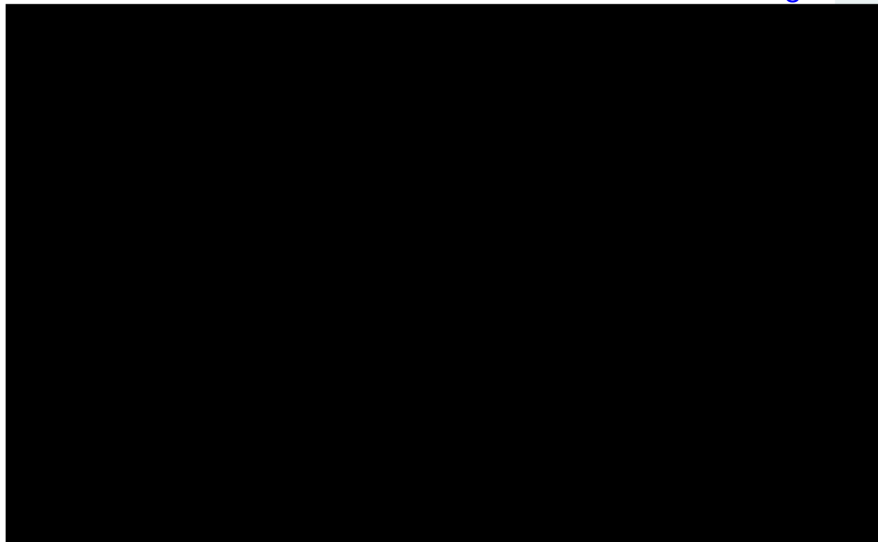[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 95.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
100% (for the corresponding app developer).

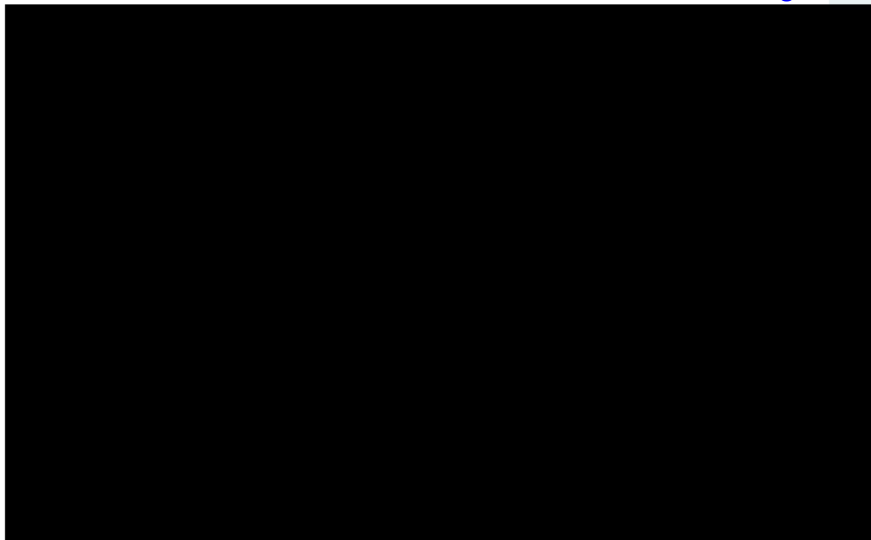Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 96.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
100% (for the corresponding app developer).

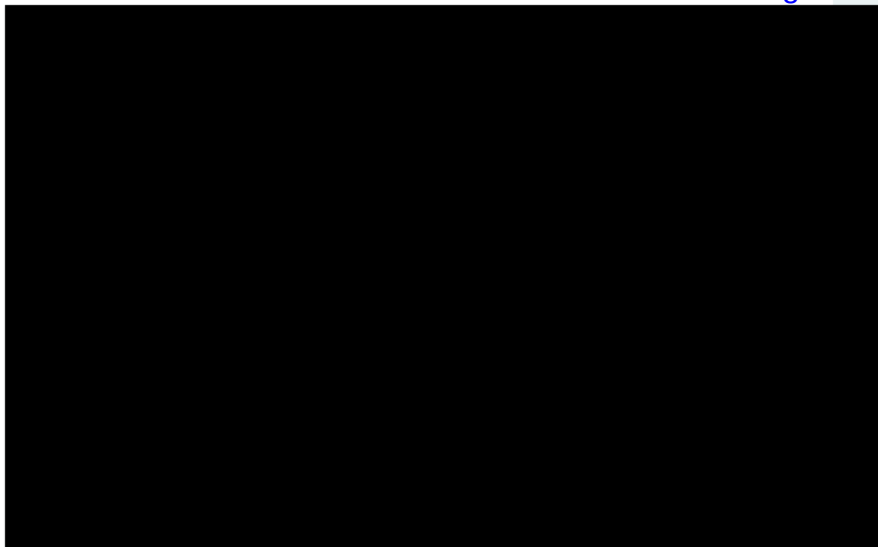Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 97.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

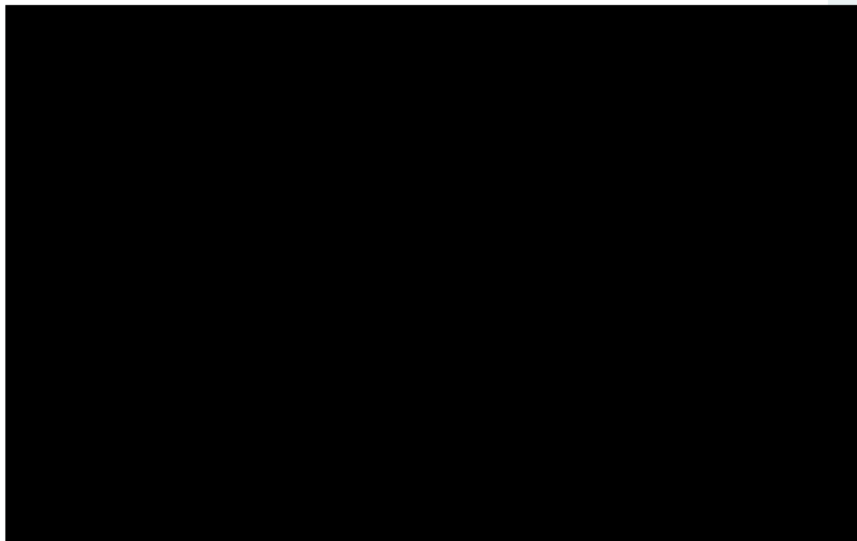Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 98.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 82% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 99.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 100.
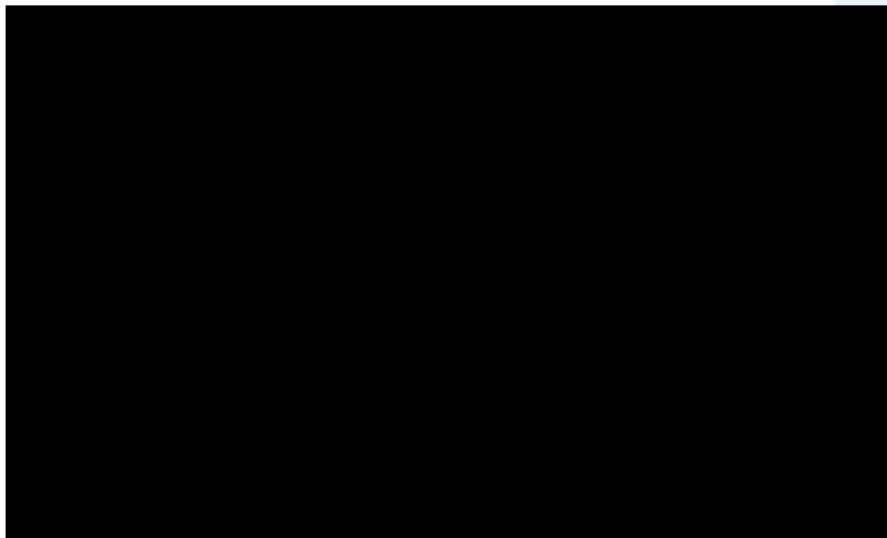[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 1.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 79% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 8.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
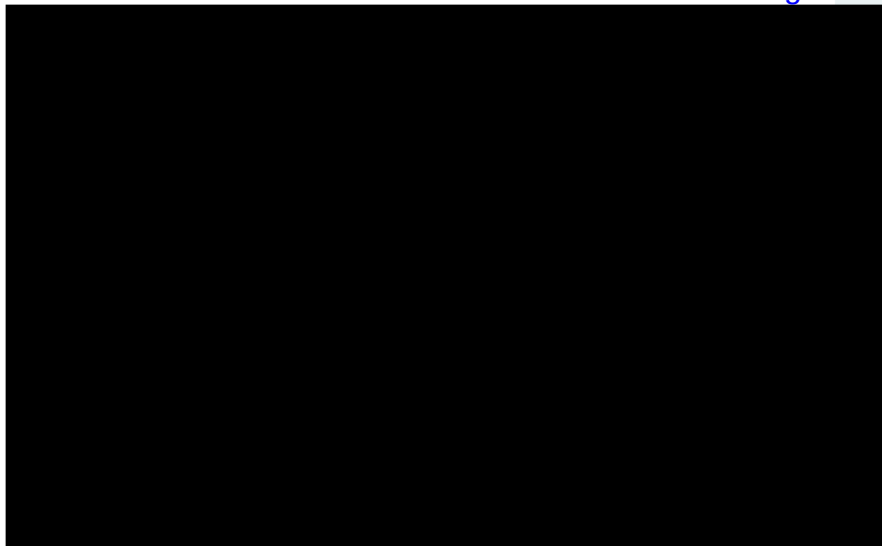83% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 40.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 68% (for the corresponding app category);
85% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 53.
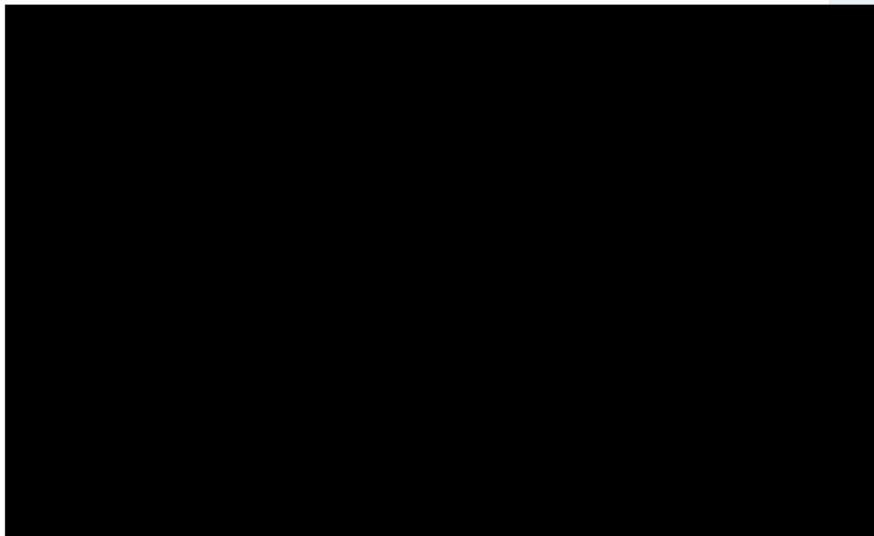[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 54.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 58.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
95% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 59.
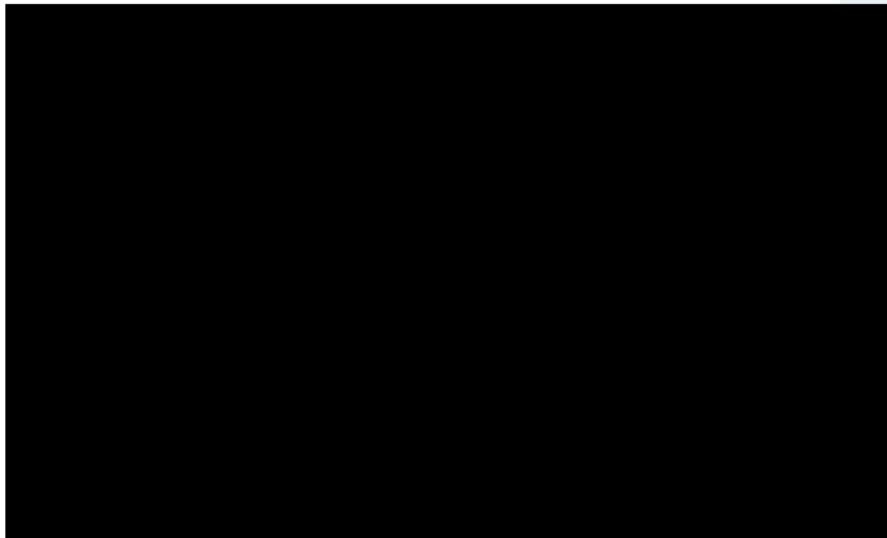[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 62.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 68% (for the corresponding app category);
92% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 64.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
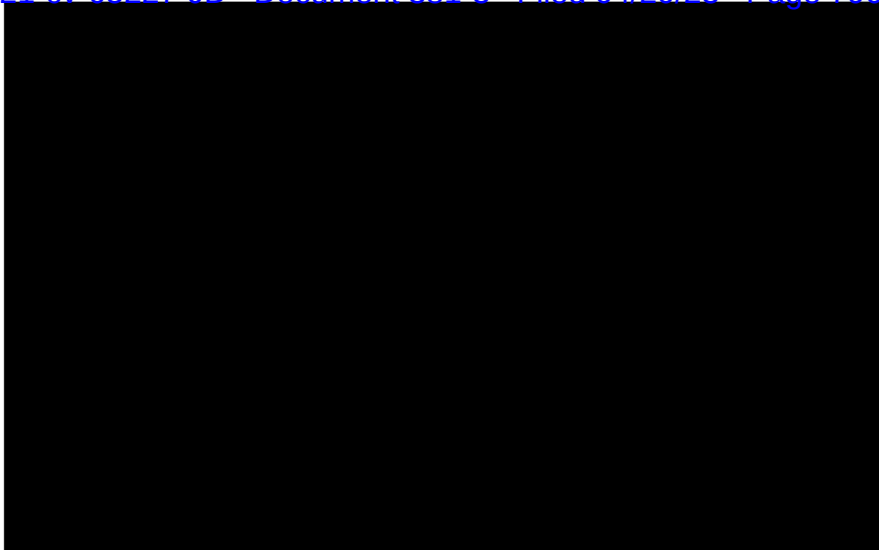100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 73.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
89% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 74.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
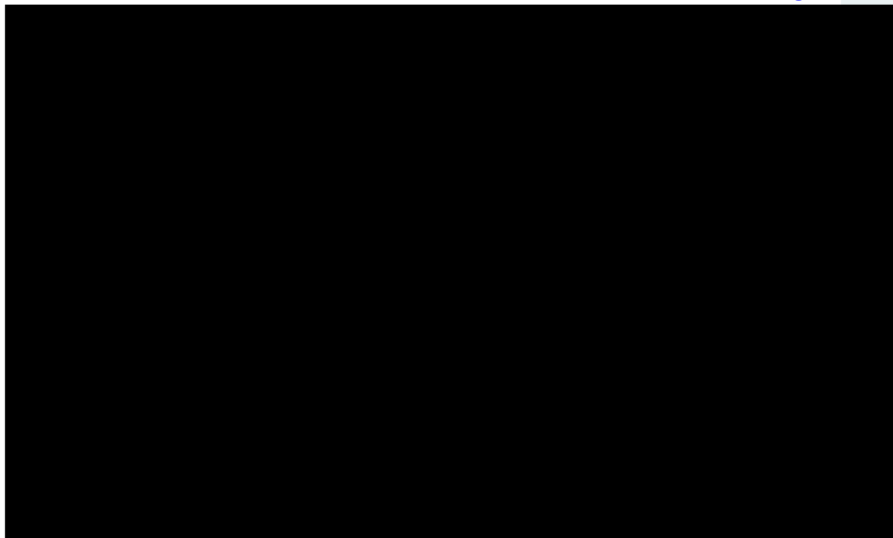100% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 79.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
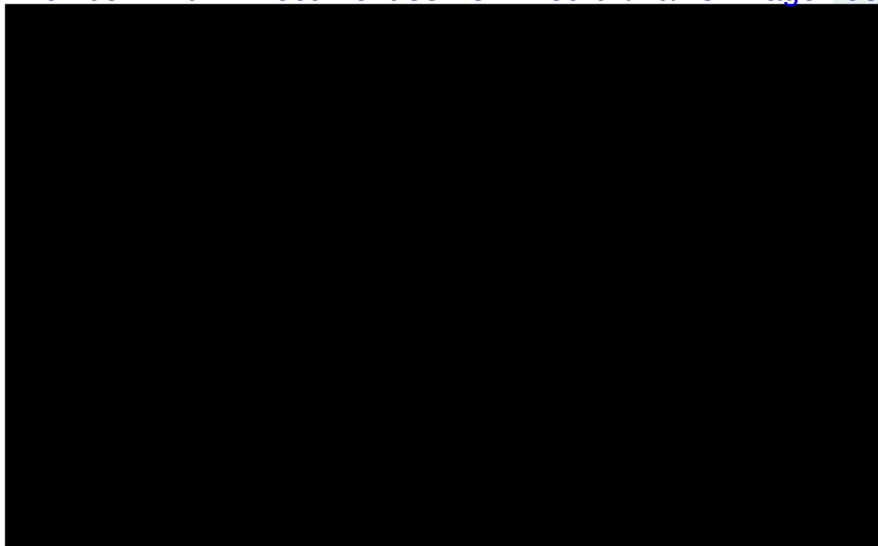86% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 83.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
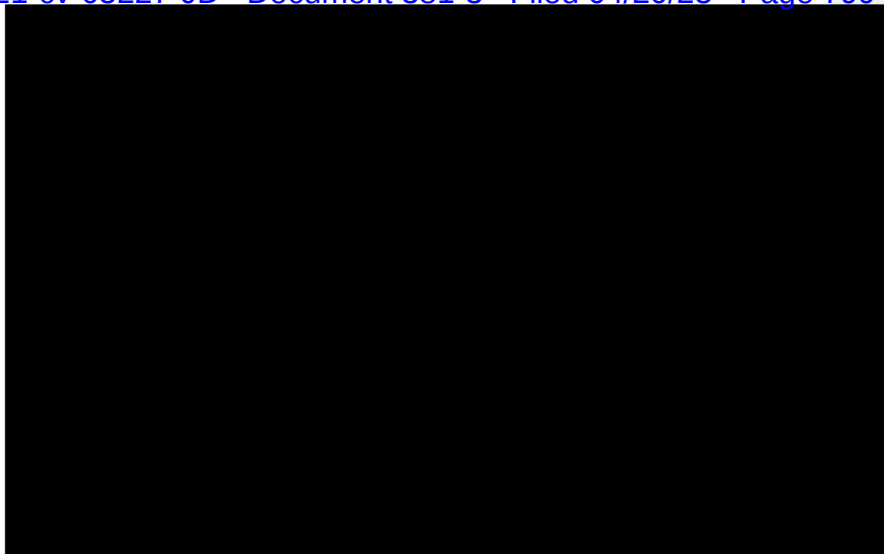98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 93.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 83% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 47.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 95% (for the corresponding app category);
94% (for the corresponding app developer).

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Exhibit 36b

Average Monthly Product Price and Service Fee Rate for the Top 100 IAPs

With A Service Fee Rate Reduction of At Least 10 Percentage Points in July 2021

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 1.
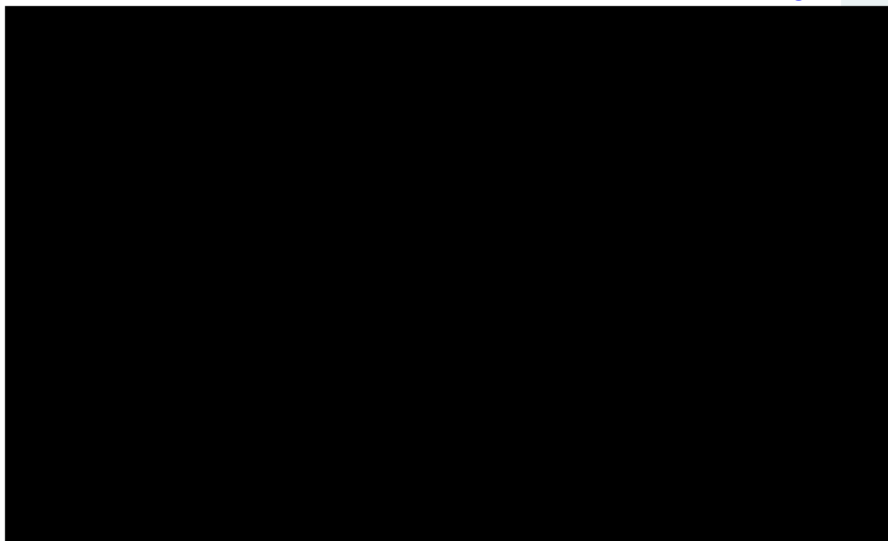[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 2.
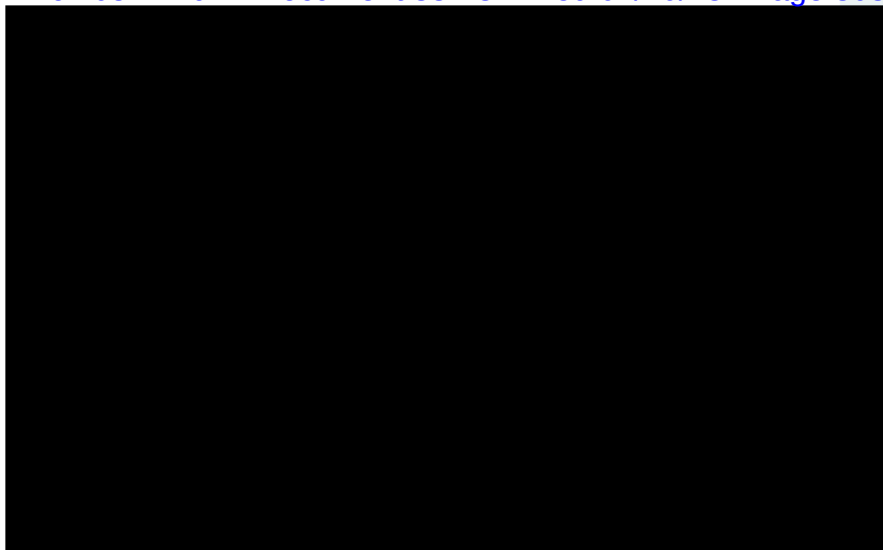[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
80% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 3.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
80% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 4.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
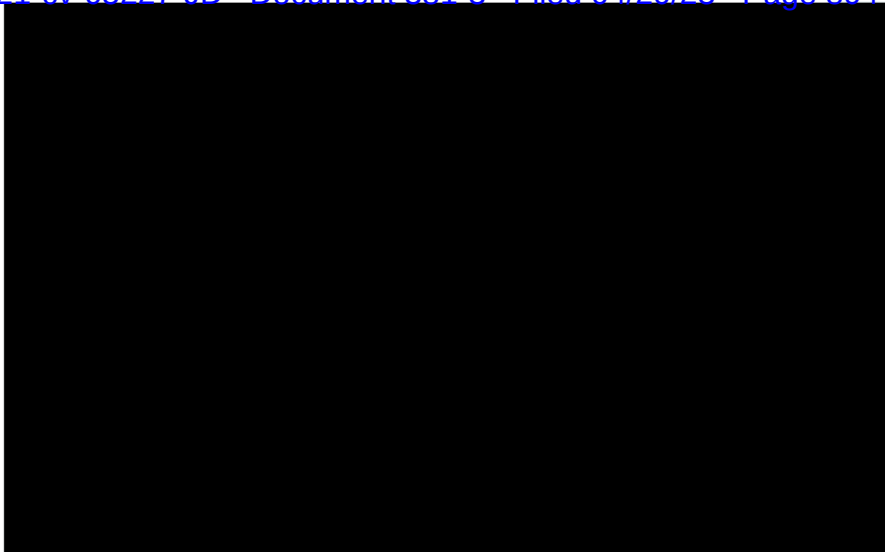99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 5.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 6.
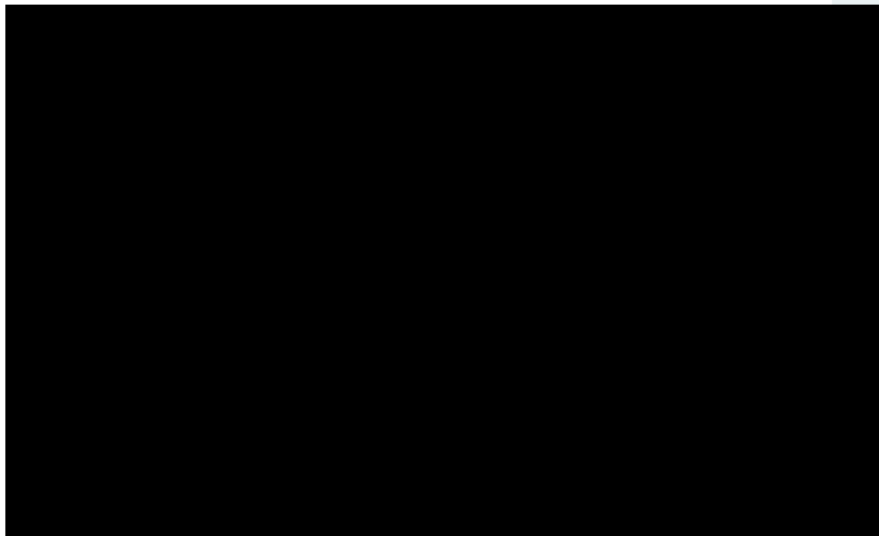[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 7.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

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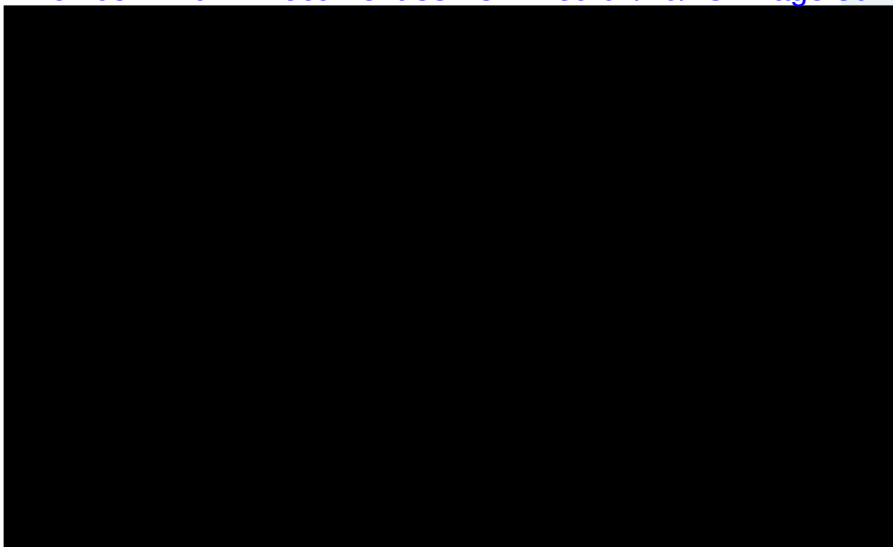
Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 8.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).
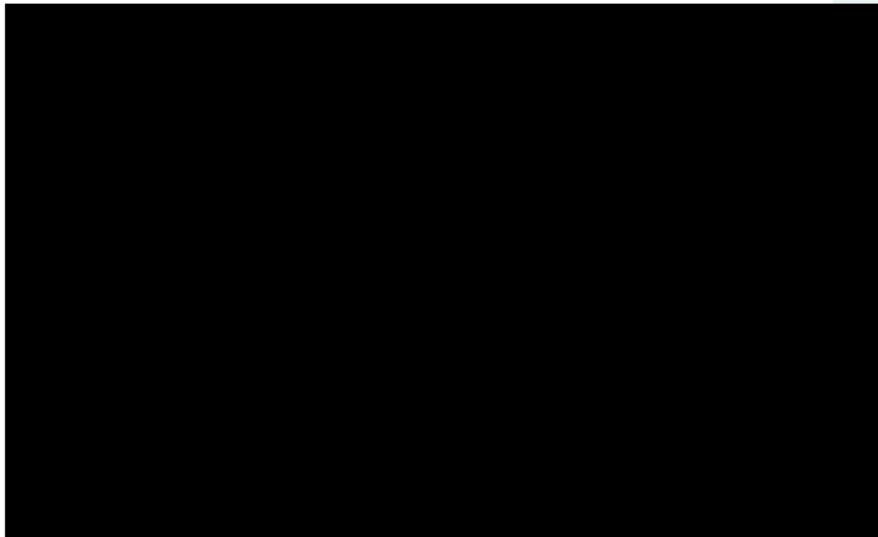
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 9.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 10.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
80% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 11.
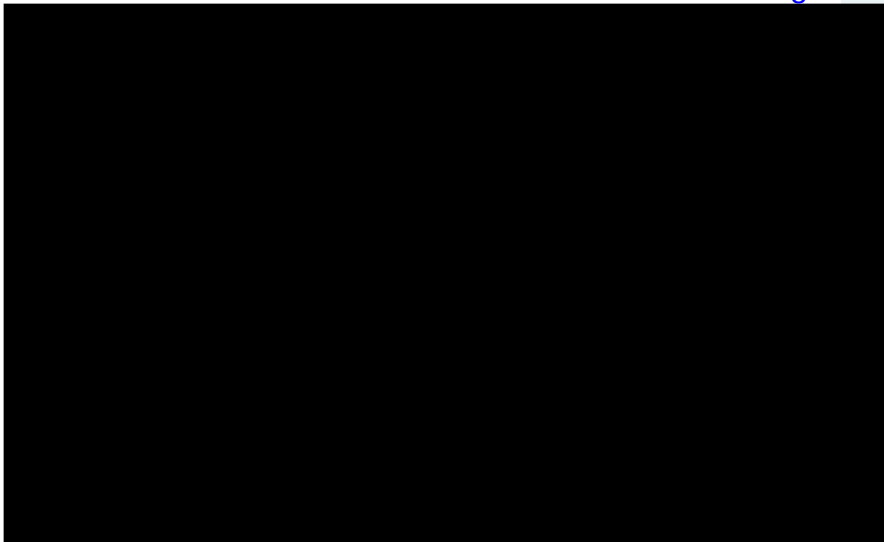[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
99% (for the corresponding app developer).

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[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 12.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
100% (for the corresponding app developer).
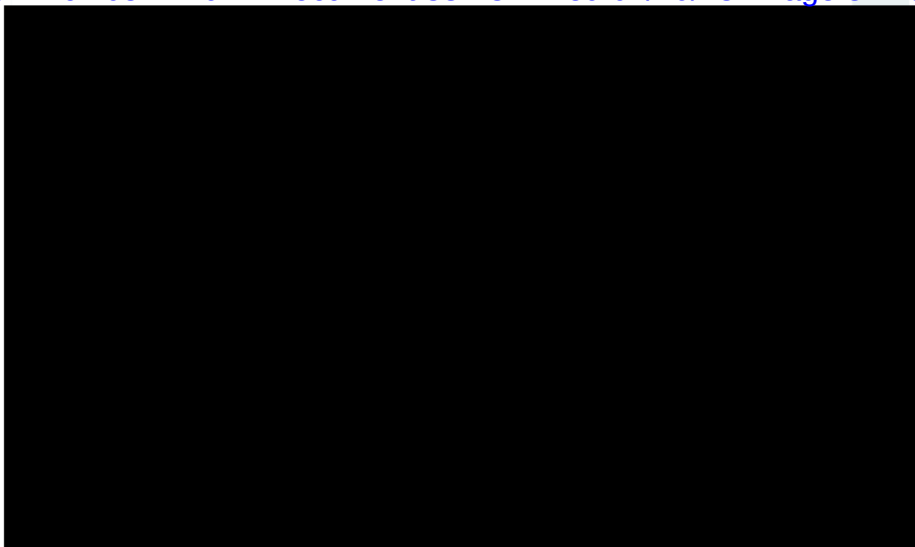
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 13.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
99% (for the corresponding app developer).

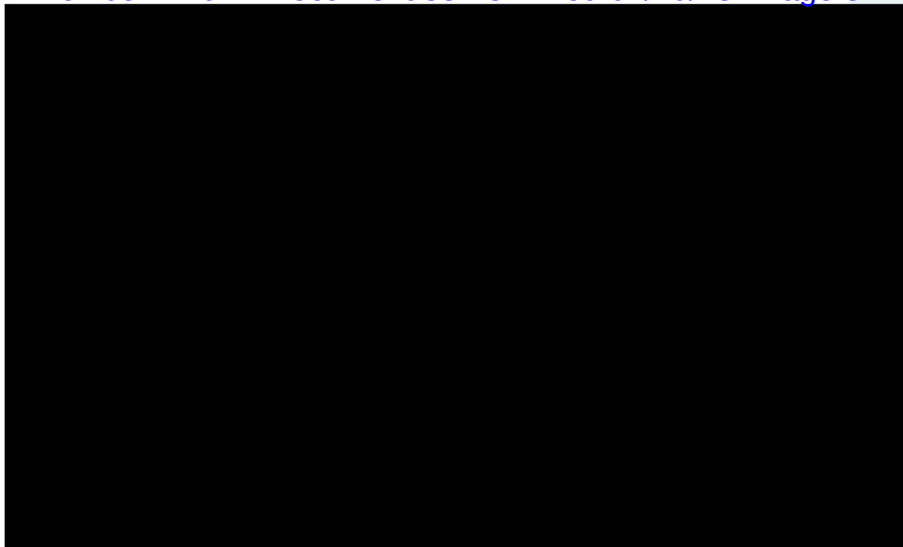Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 14.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 99% (for the corresponding app developer).

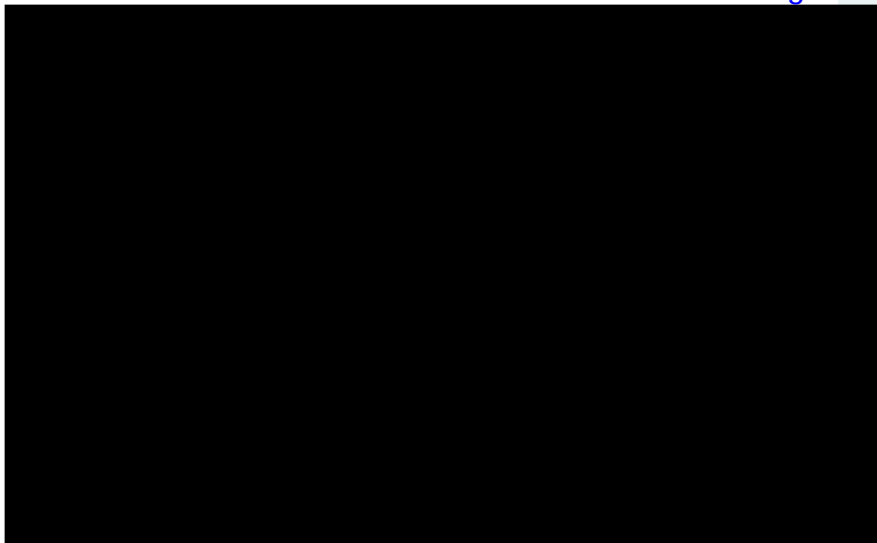Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 15.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 16.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 17.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 79% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 18.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 19.
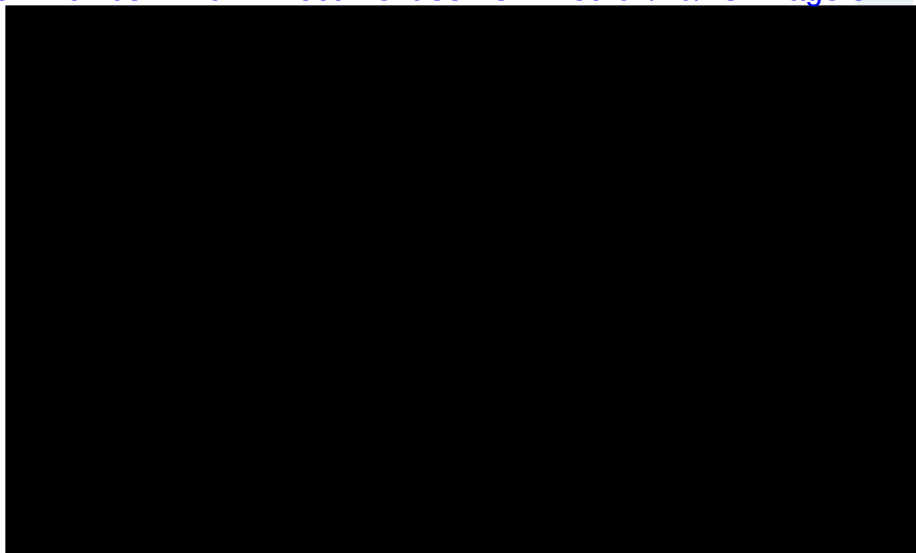[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category); 100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 20.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 21.
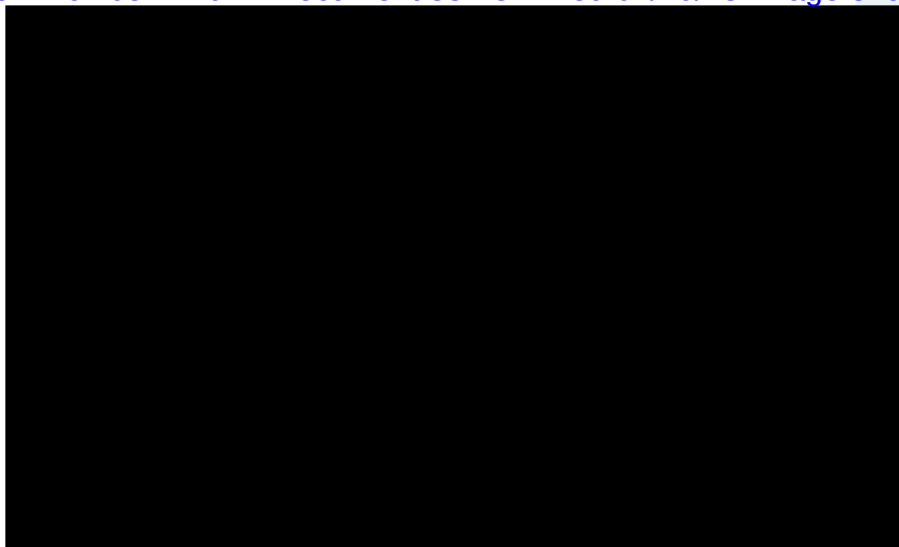[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 22.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 23.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 24.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 25.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 26.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 28.
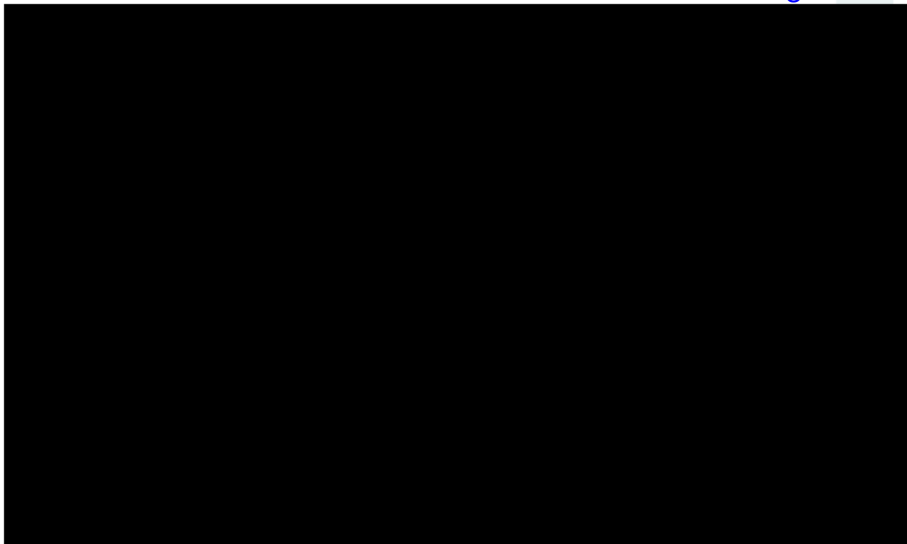[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 29.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 30.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 31.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category); 97% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 32.
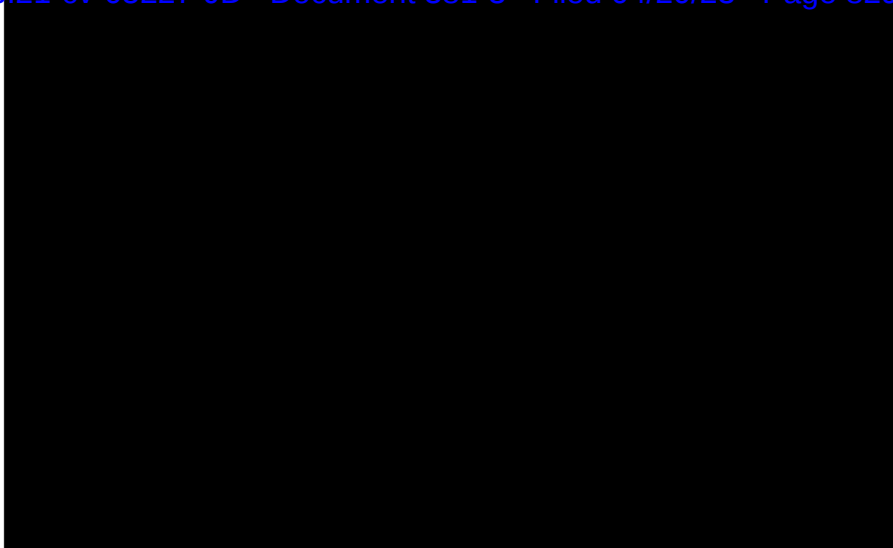[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 33.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 60% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 34.
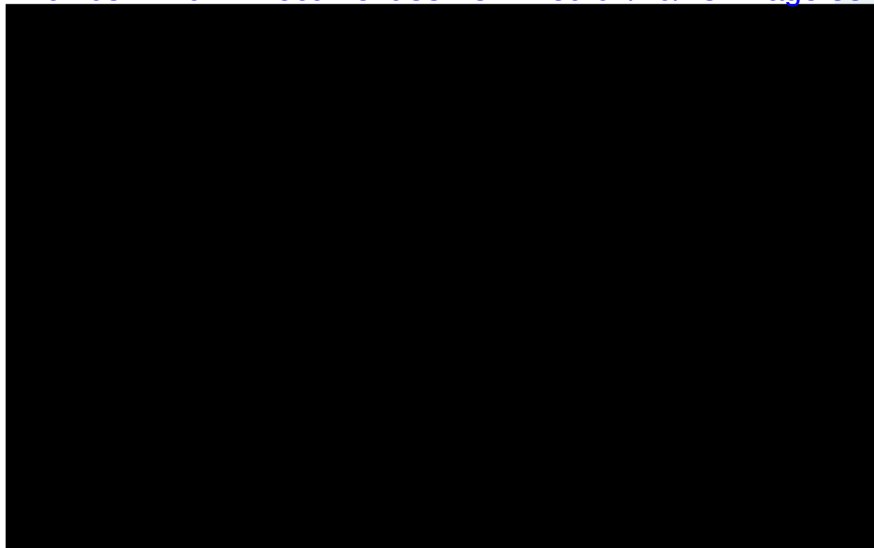[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 35.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 36.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 37.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 38.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 39.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 40.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 41.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 42.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 82% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 43.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 44.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
80% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 46.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 47.
[2] Price change before and after July 2021: no change in list price, no change in net price.
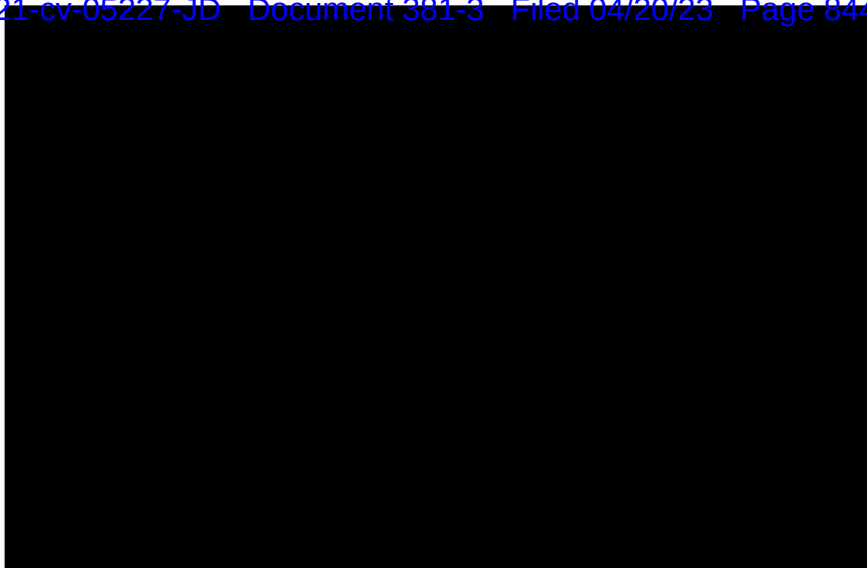[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 48.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 49.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
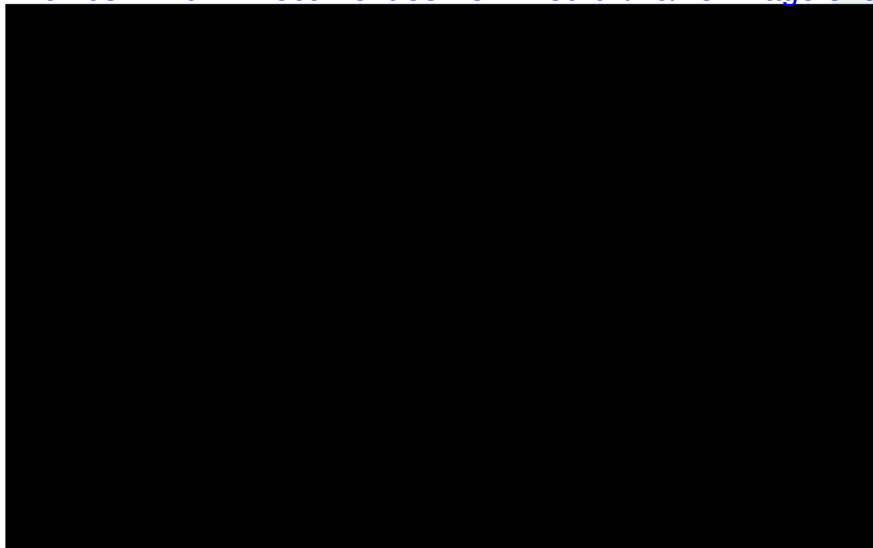99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 50.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 51.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 52.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 53.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
92% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 54.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 55.
[2] Price change before and after July 2021: no change in list price, no change in net price.
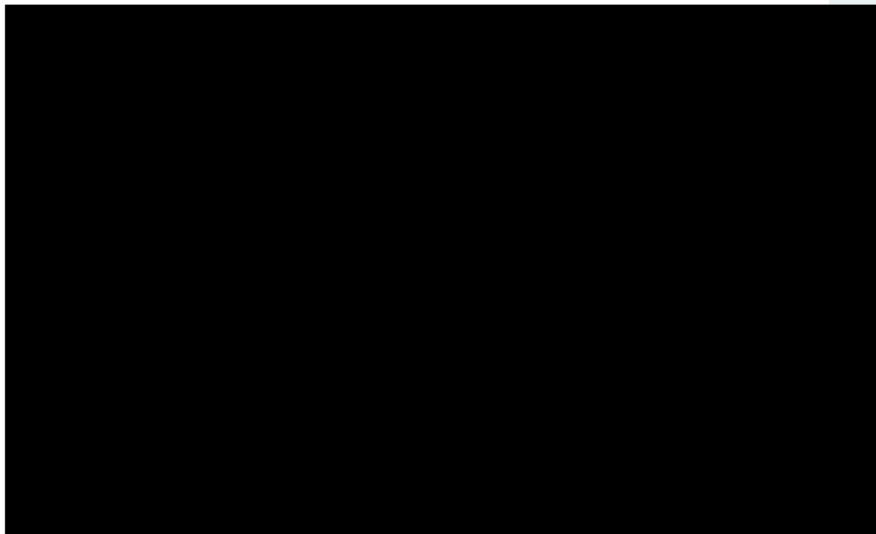[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category); 99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 56.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
99% (for the corresponding app developer).
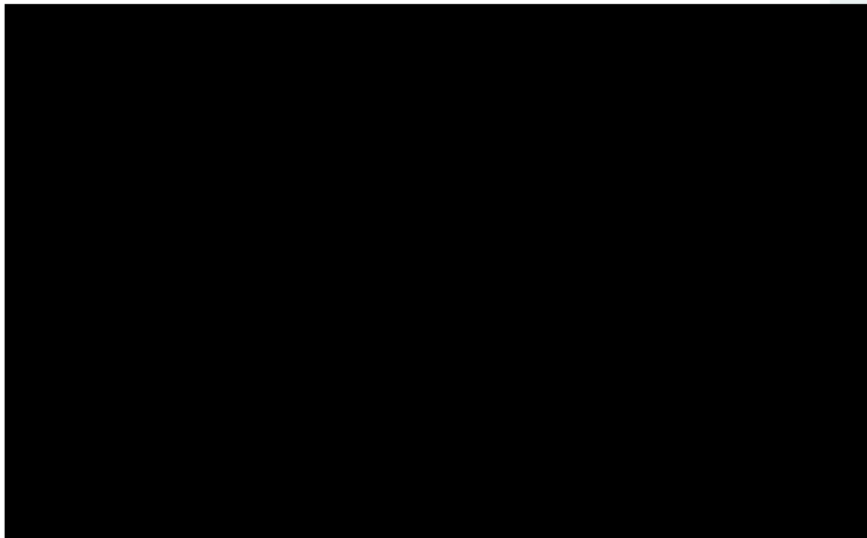
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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 57.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 58.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 59.
[2] Price change before and after July 2021: no change in list price, no change in net price.
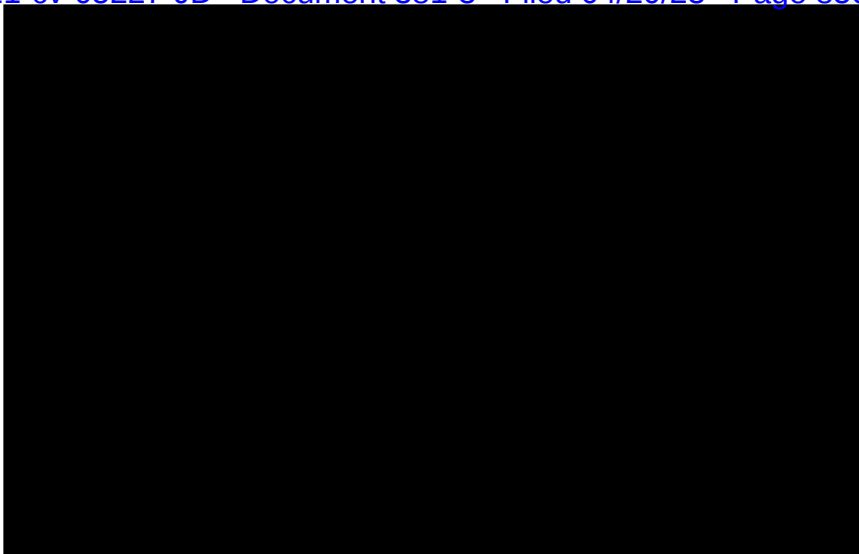[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 60.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 62.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 62% (for the corresponding app category);
97% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 63.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 64.
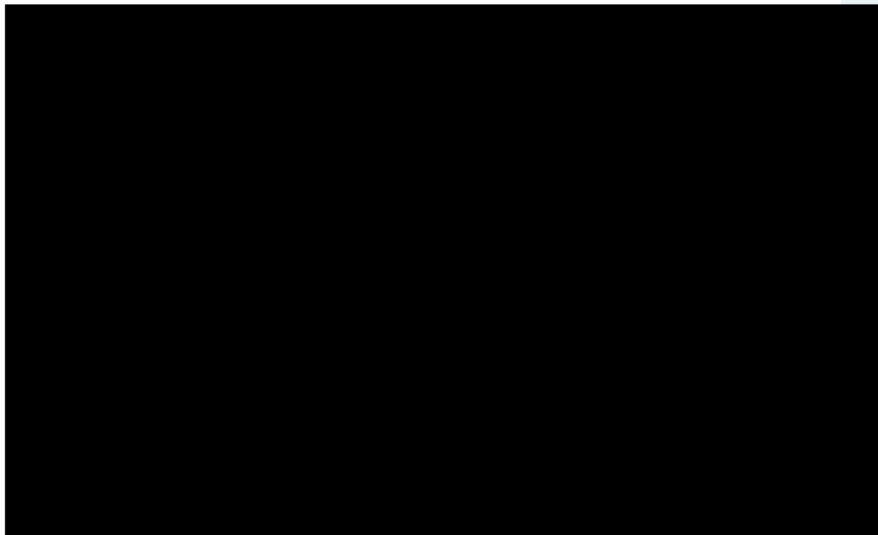[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
78% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 65.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
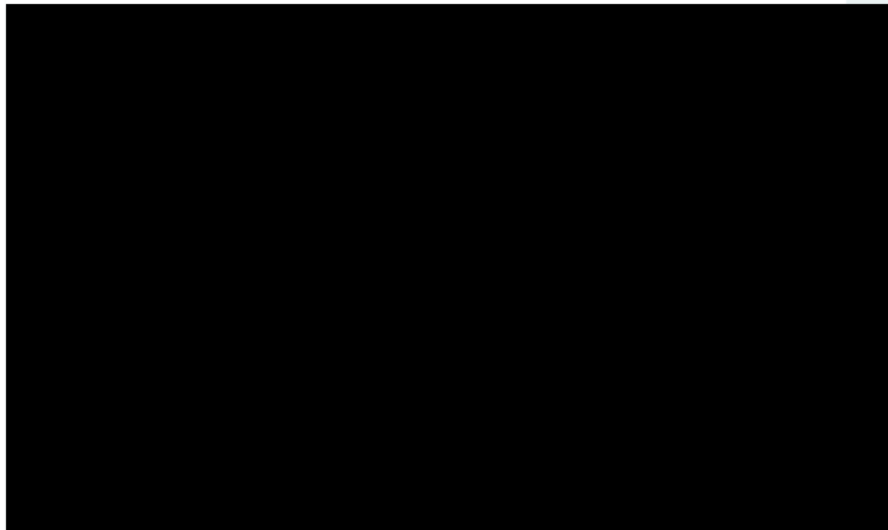99% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 66.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 67.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
97% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 68.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
99% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 69.
[2] Price change before and after July 2021: no change in list price, no change in net price.
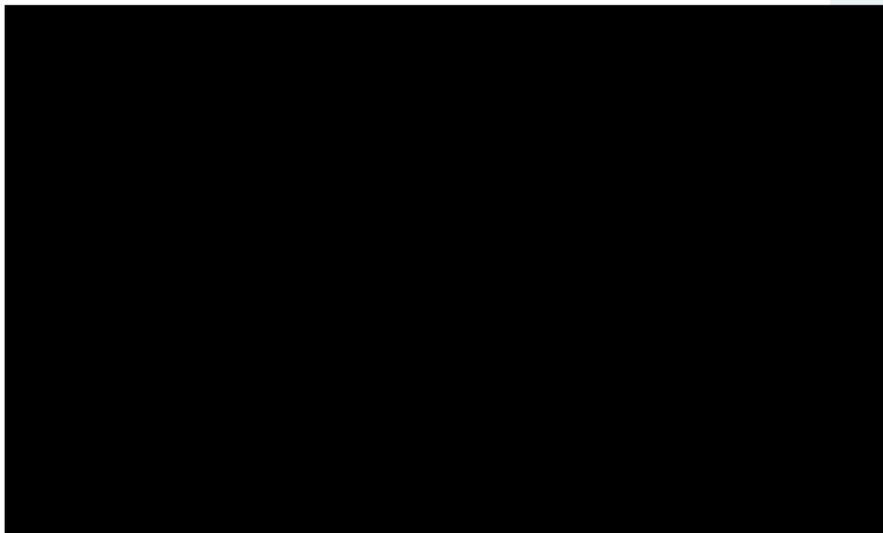[3] Pass-through rate predicted by Dr. Singer's approach: 60% (for the corresponding app category);
97% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 71.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
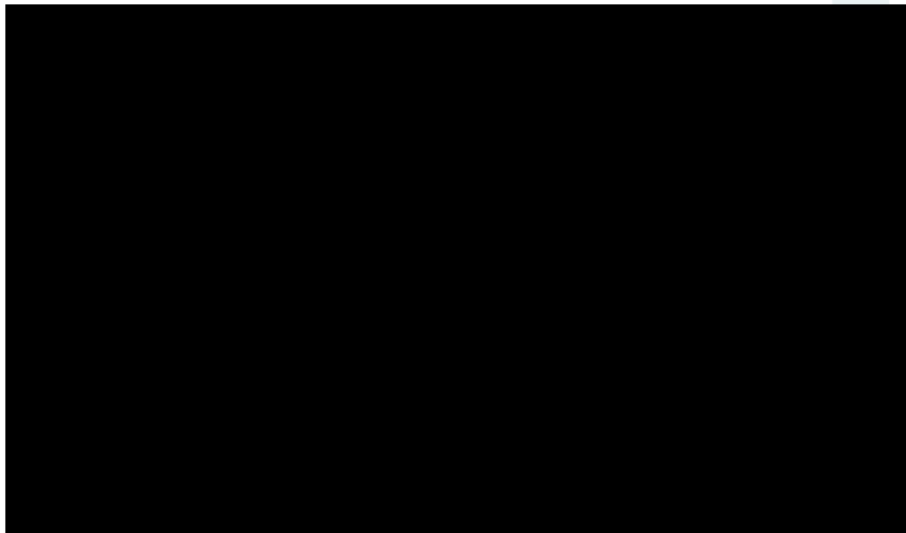99% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 73.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 74.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
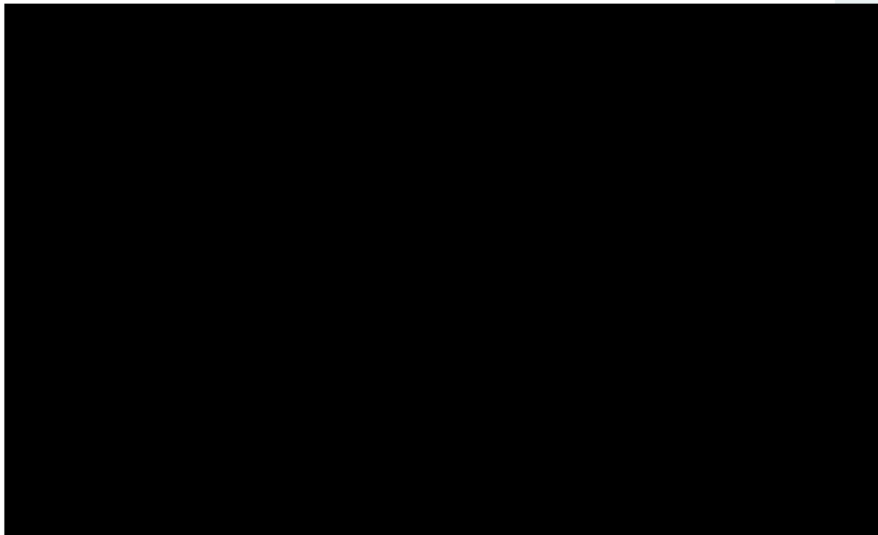100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 75.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 86% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 76.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 62% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 77.
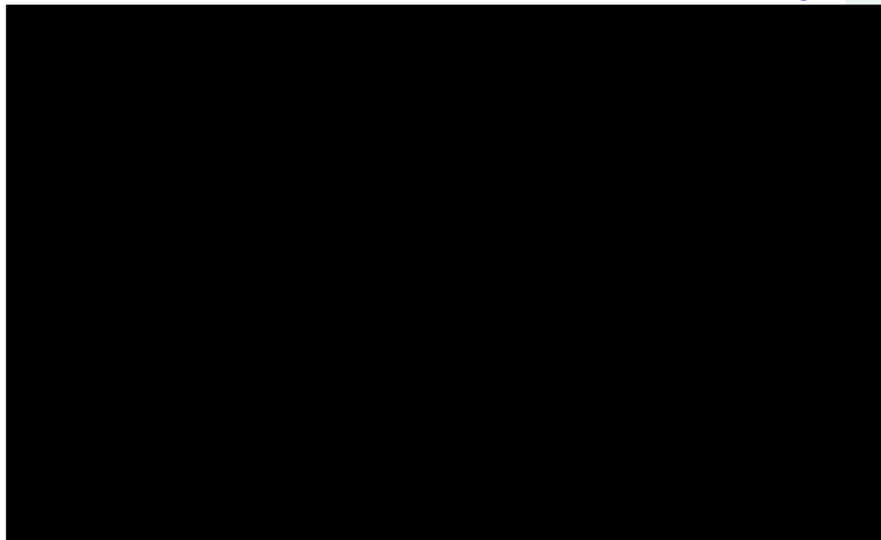[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 79.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 80.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 79% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 81.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 82.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
78% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 84.
[2] Price change before and after July 2021: no change in list price, no change in net price.
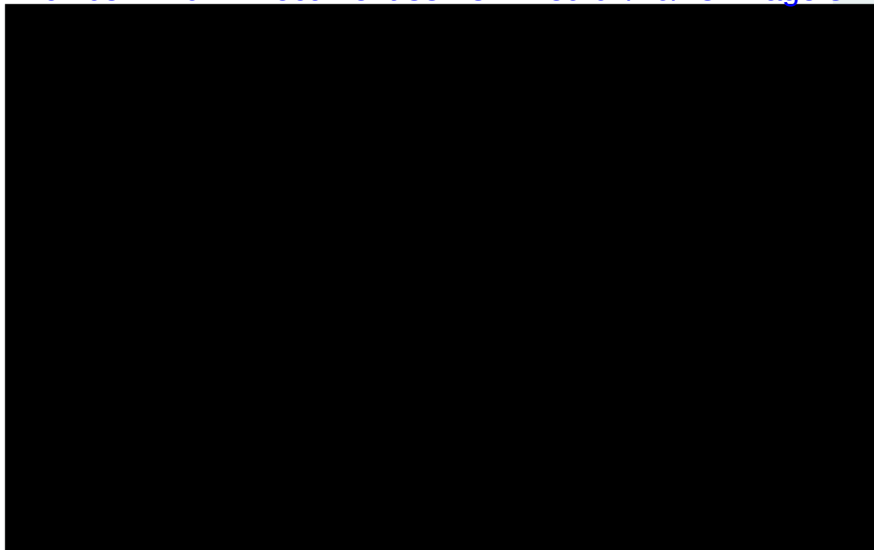[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 85.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
98% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 86.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 88.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
99% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 89.
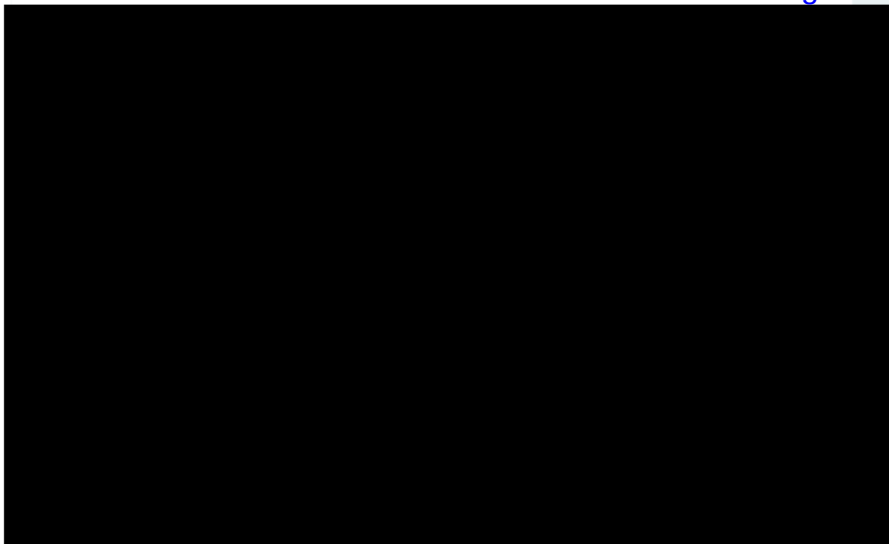[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 90.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 80% (for the corresponding app category);
93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 91.
[2] Price change before and after July 2021: no change in list price, no change in net price.
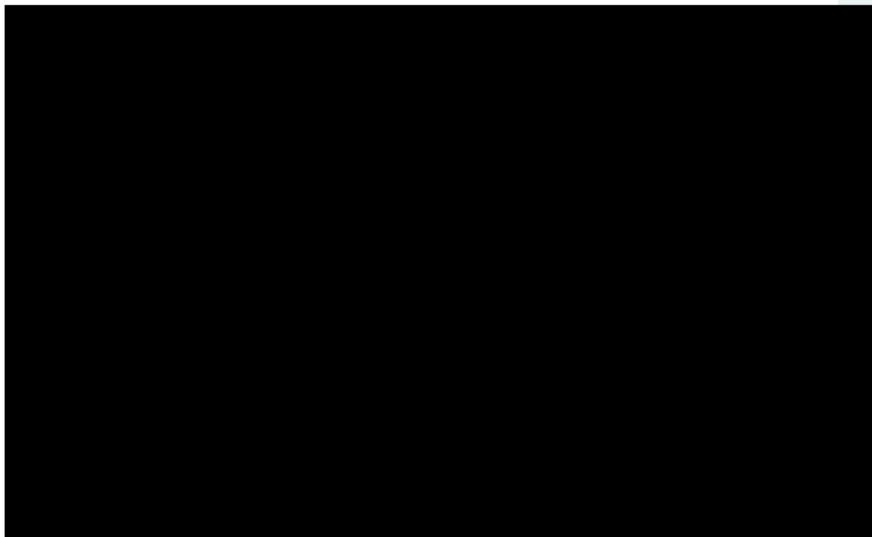[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 92.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).
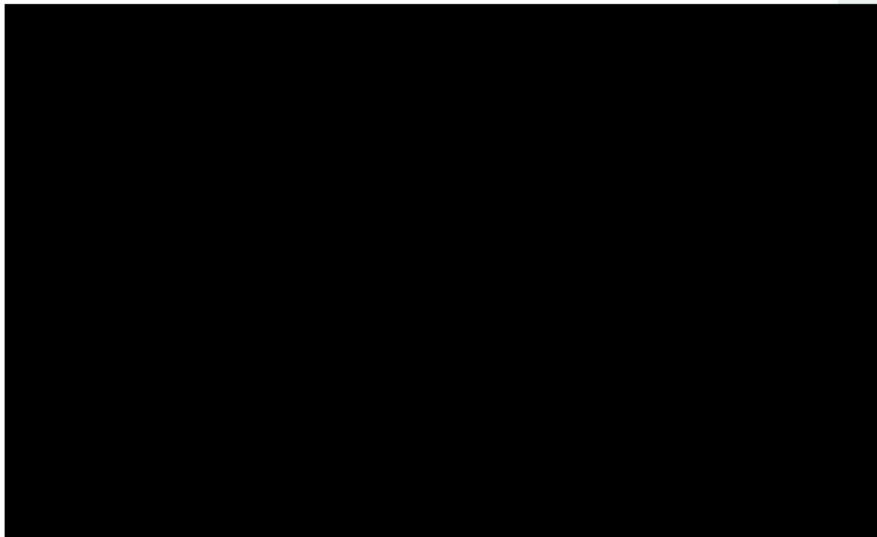
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 93.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 94.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
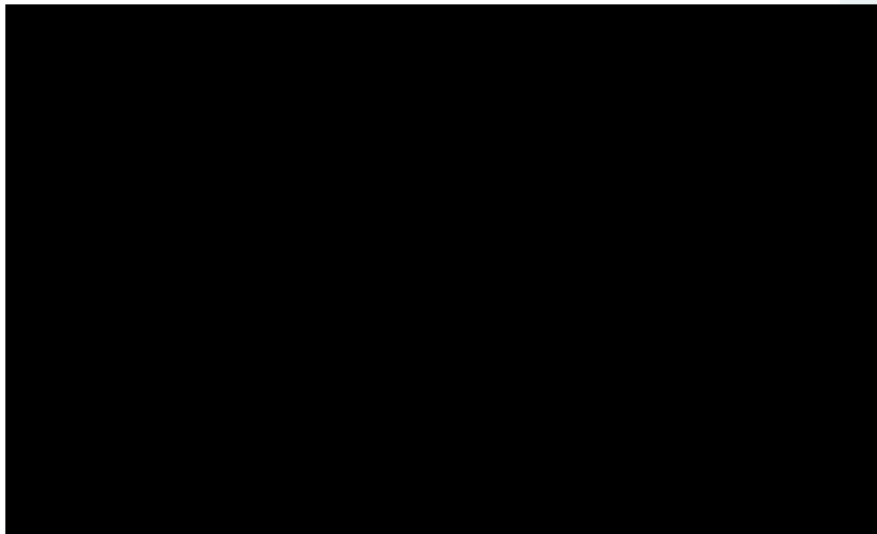100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 96.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category); 93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 97.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 98.
[2] Price change before and after July 2021: no change in list price, no change in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 60% (for the corresponding app category);
97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 99.
[2] Price change before and after July 2021: no change in list price, no change in net price.
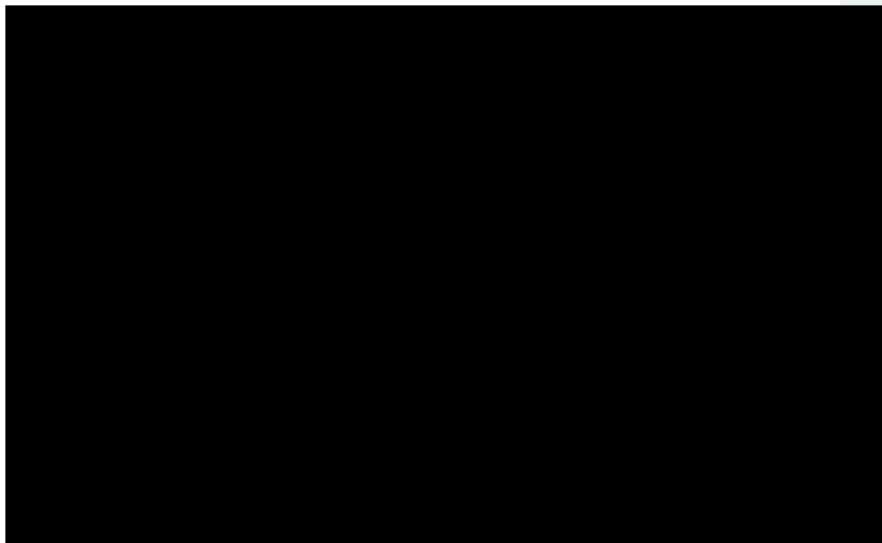[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 27.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 45.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
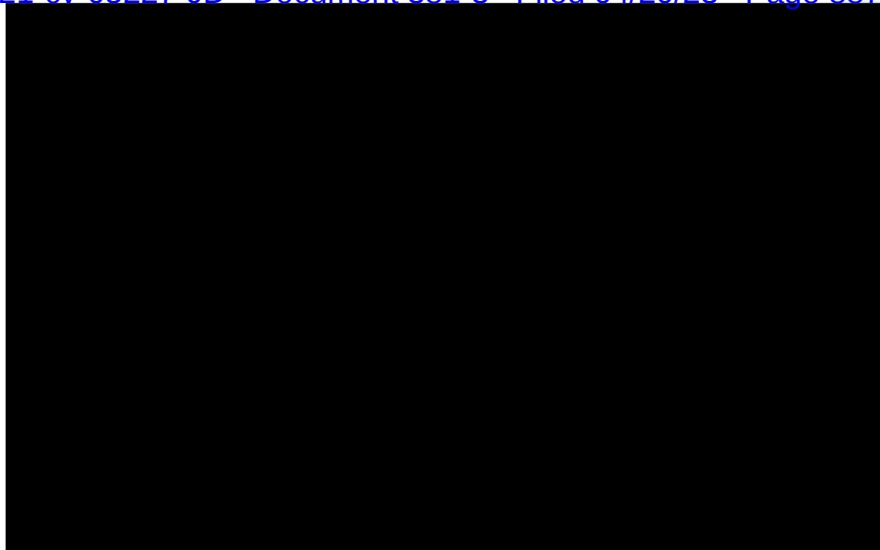99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 61.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
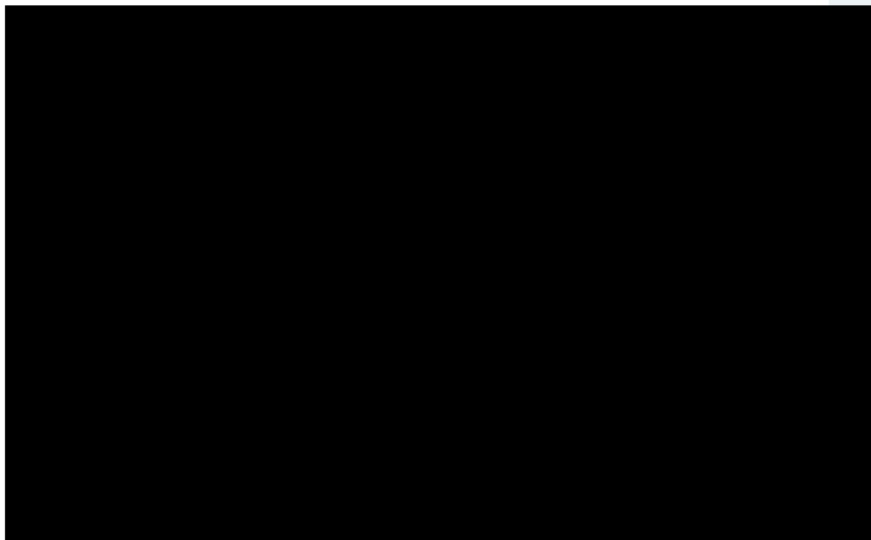92% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 70.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 79% (for the corresponding app category);
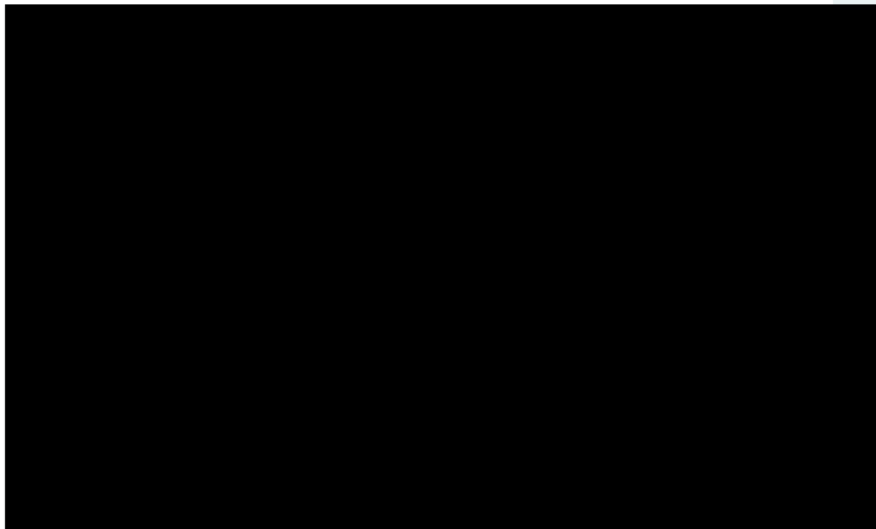97% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 72.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 83.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
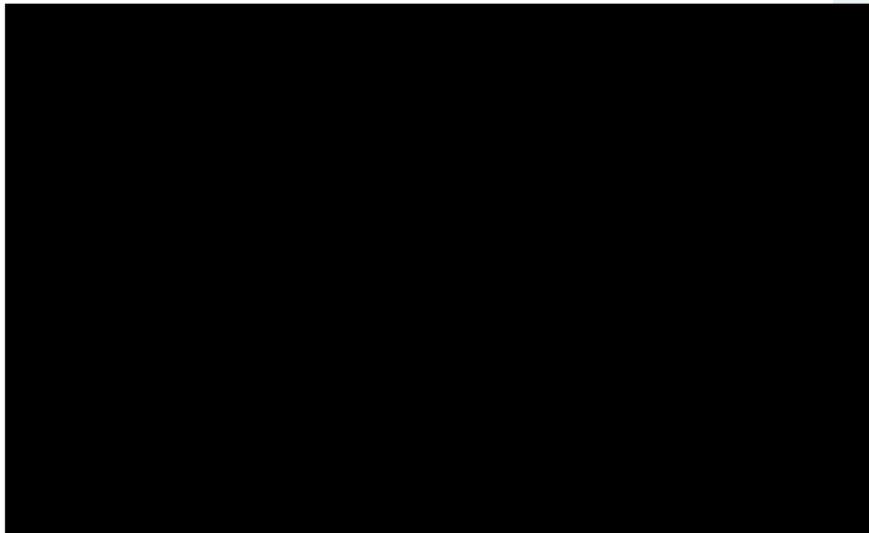100% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 87.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
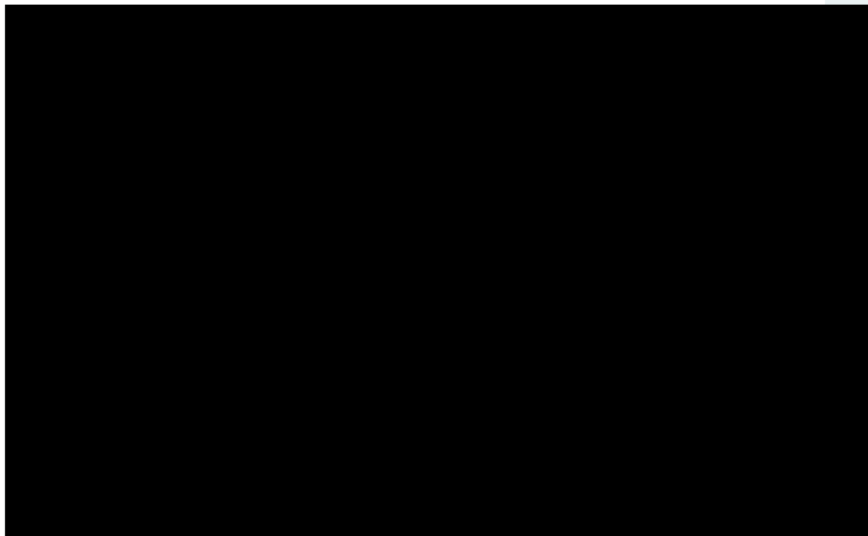99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 95.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 100.
[2] Price change before and after July 2021: increase in list price, increase in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
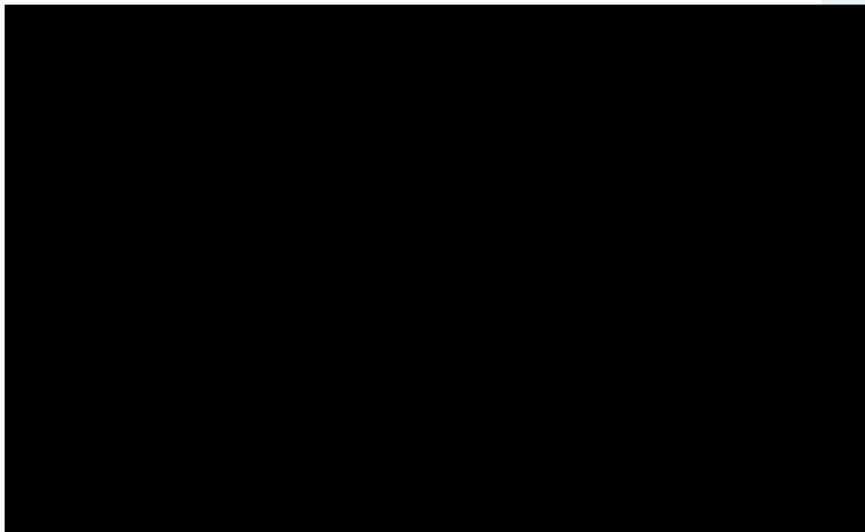99% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 78.
[2] Price change before and after July 2021: decrease in list price, decrease in net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
100% (for the corresponding app developer).

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Exhibit 36c

Average Monthly Product Price and Service Fee Rate for the Top 100 IAPs

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 1.
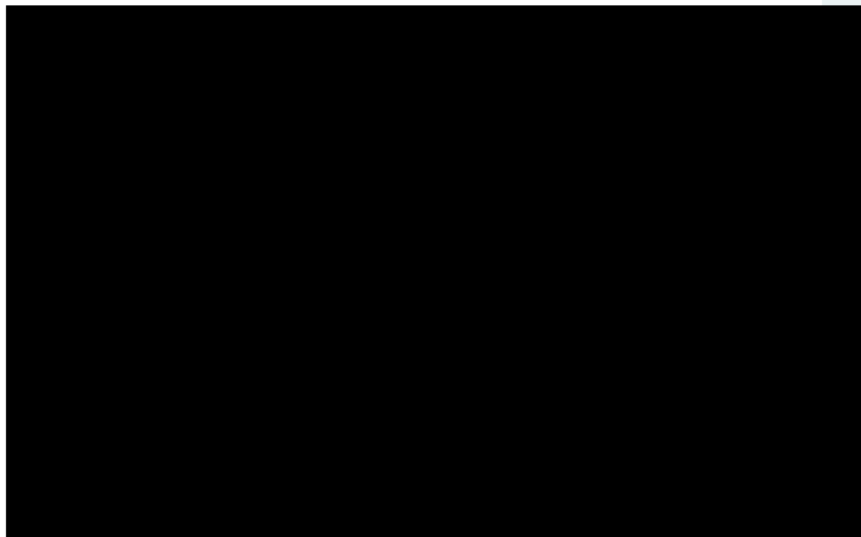[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
94% (for the corresponding app developer).
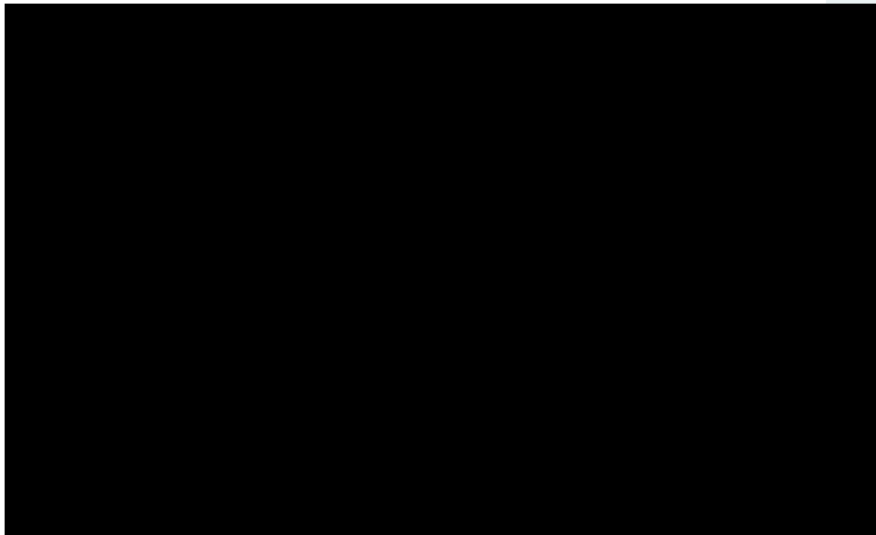
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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 2.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
53% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 3.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
53% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 4.
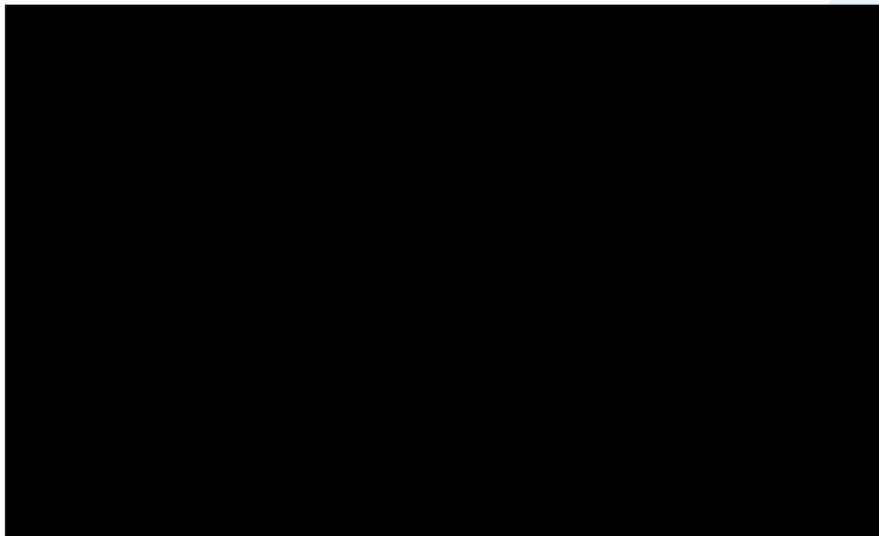[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category); 55% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 5.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
64% (for the corresponding app developer).
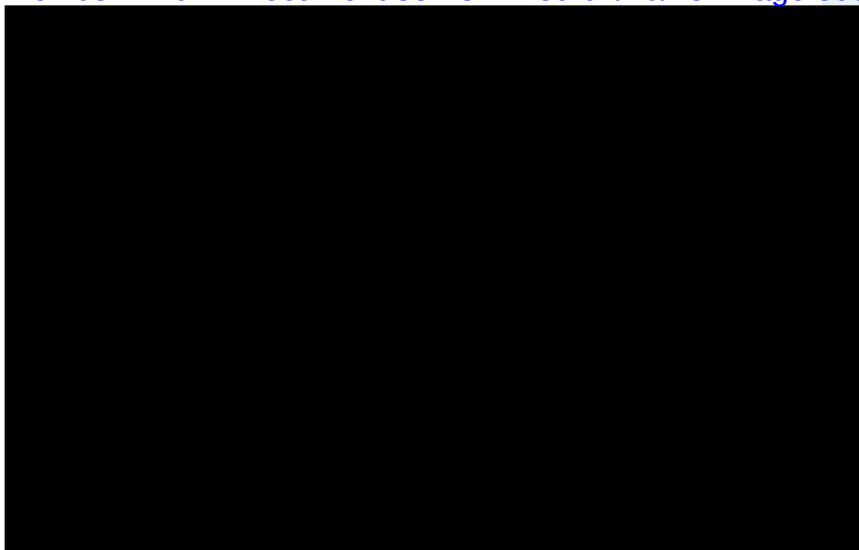
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 6.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
64% (for the corresponding app developer).
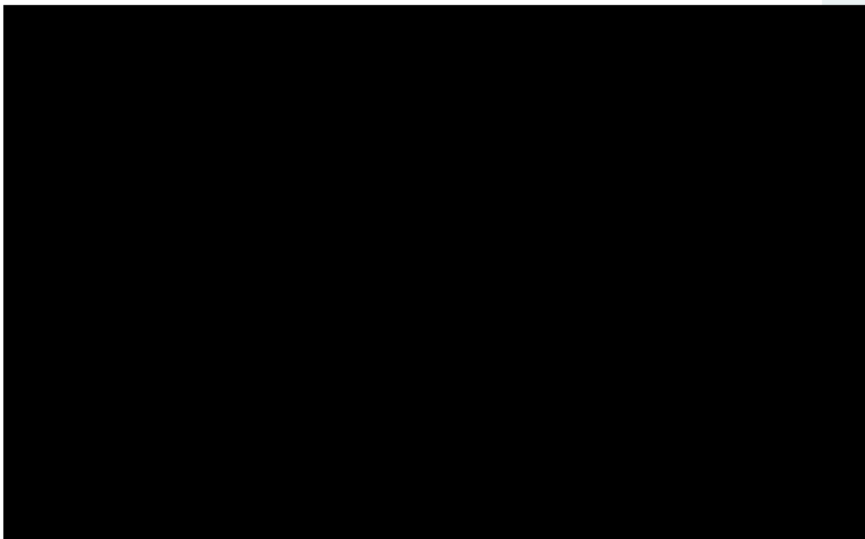
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 7.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category); 55% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 8.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
98% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 9.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
86% (for the corresponding app developer).

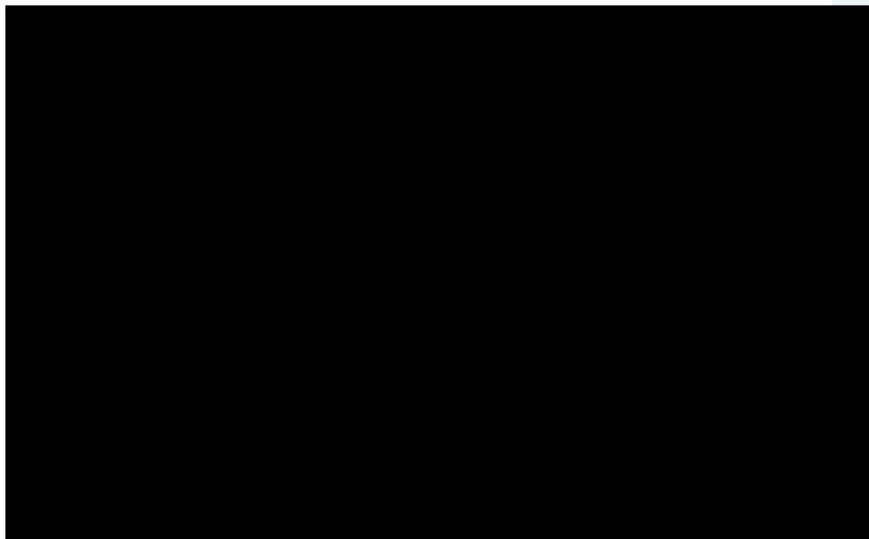Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 10.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
39% (for the corresponding app developer).

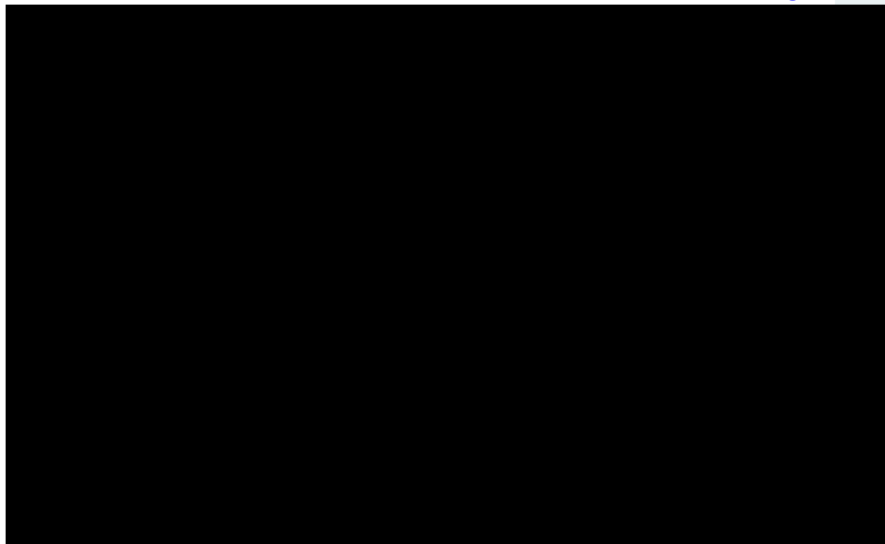Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 11.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
39% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 12.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
39% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 13.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
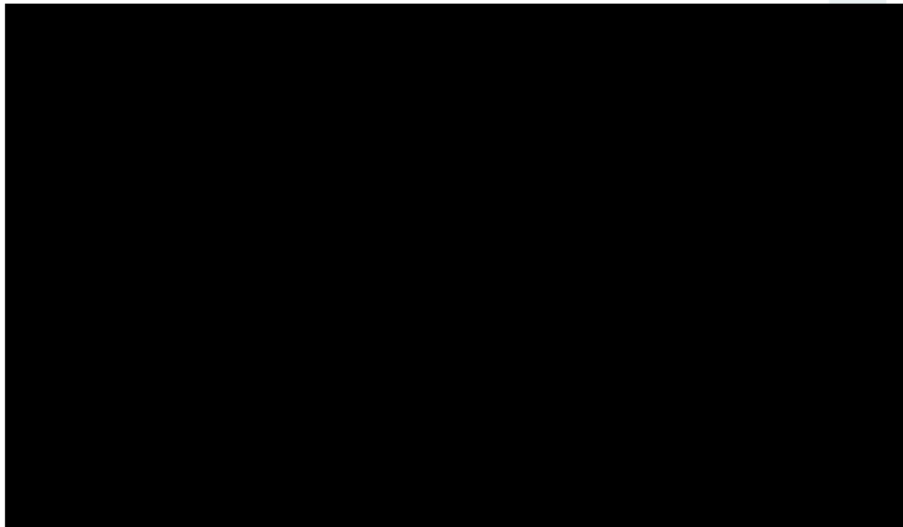[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
39% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 14.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category); 53% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 15.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
81% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 17.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
53% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 18.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
64% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 19.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
53% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 21.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
39% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 22.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
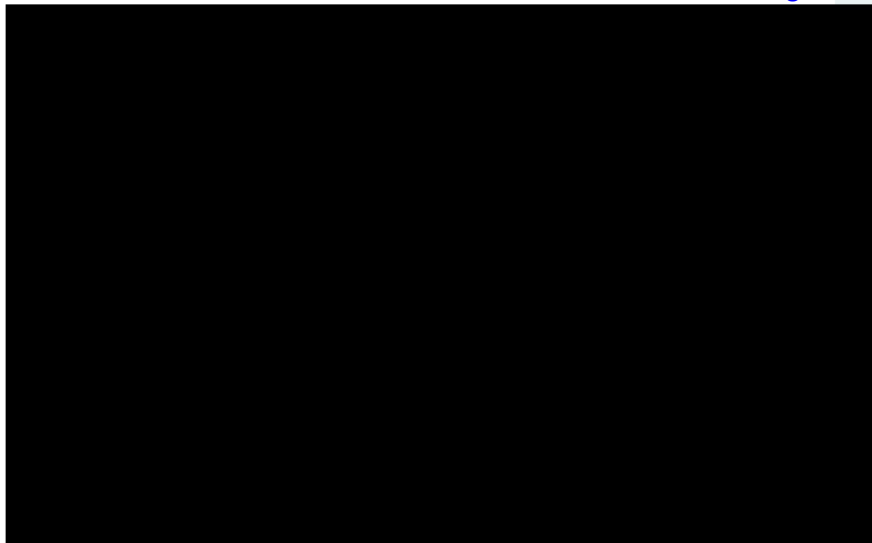[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
39% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 23.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
72% (for the corresponding app developer).

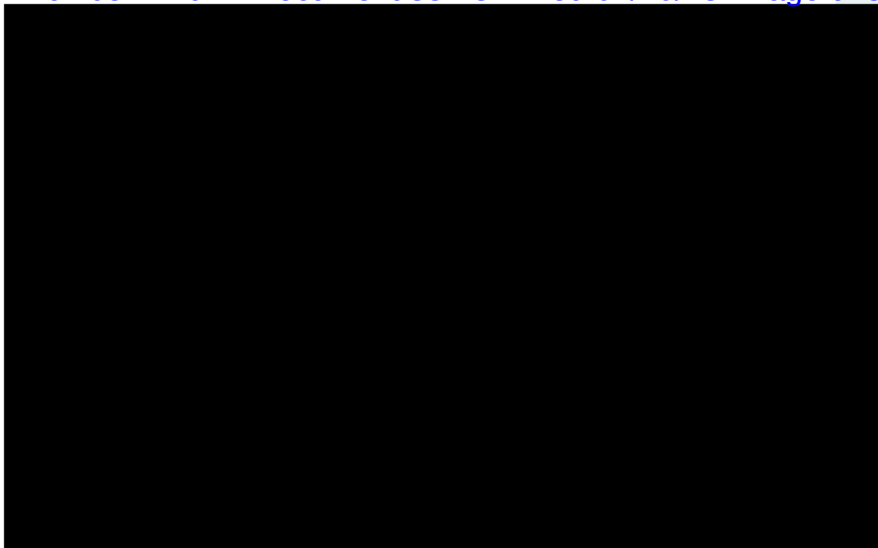Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 24.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 25.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
39% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 26.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category); 95% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 27.
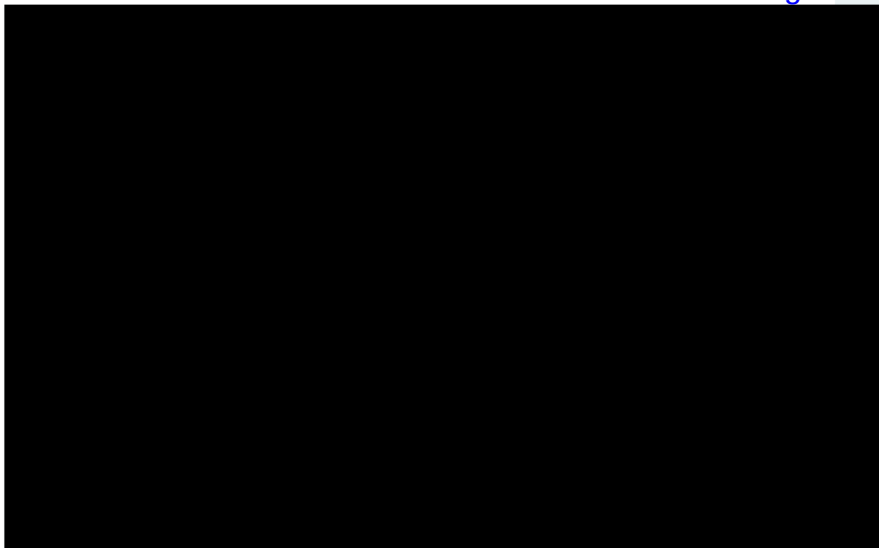[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
99% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 28.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
74% (for the corresponding app developer).

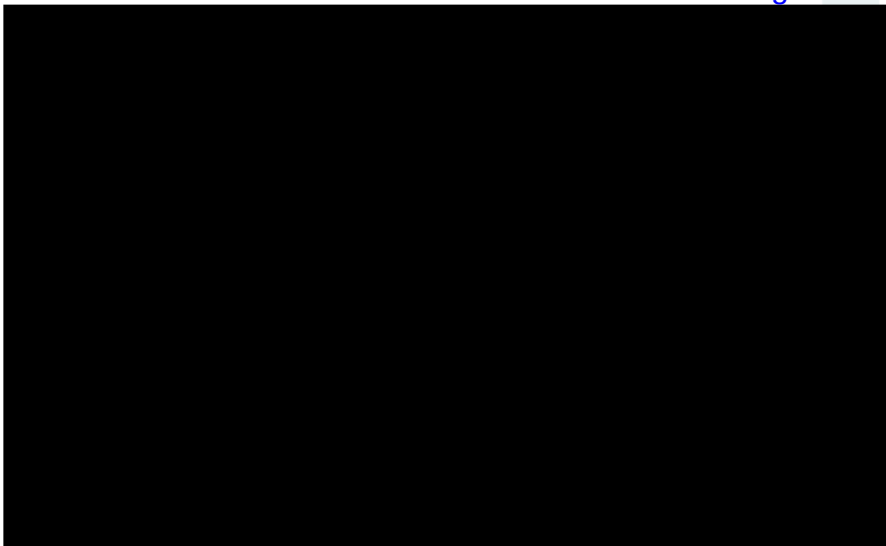Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 29.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
74% (for the corresponding app developer).

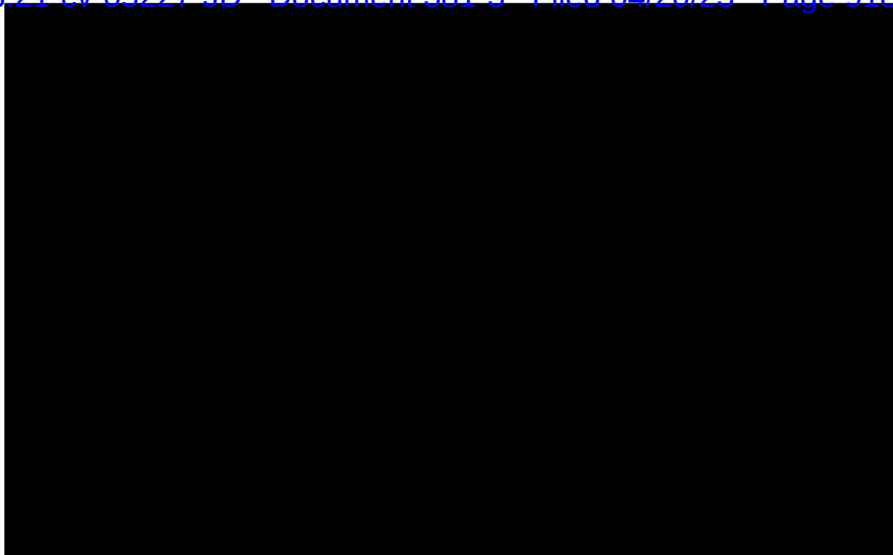Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 30.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
96% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 31.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
84% (for the corresponding app developer).

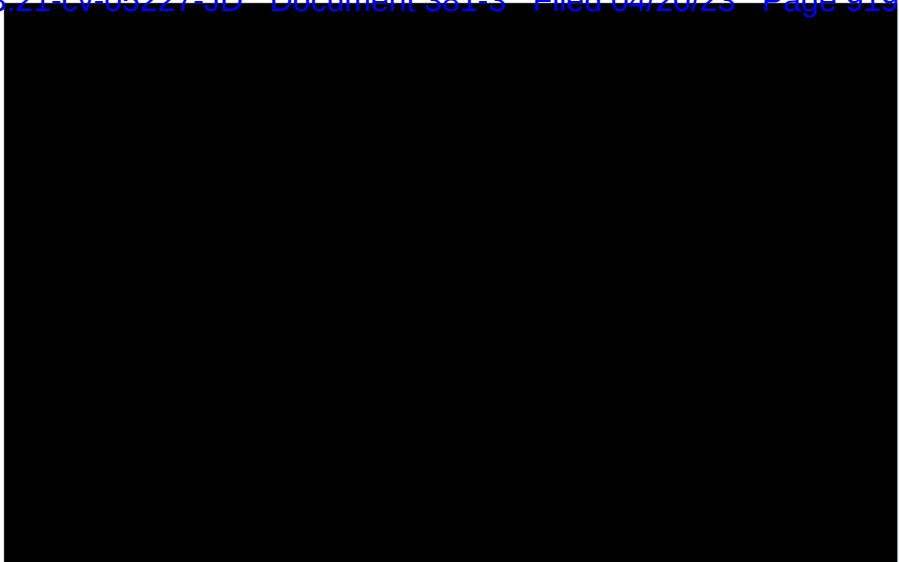Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 32.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
74% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 33.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
88% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 34.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
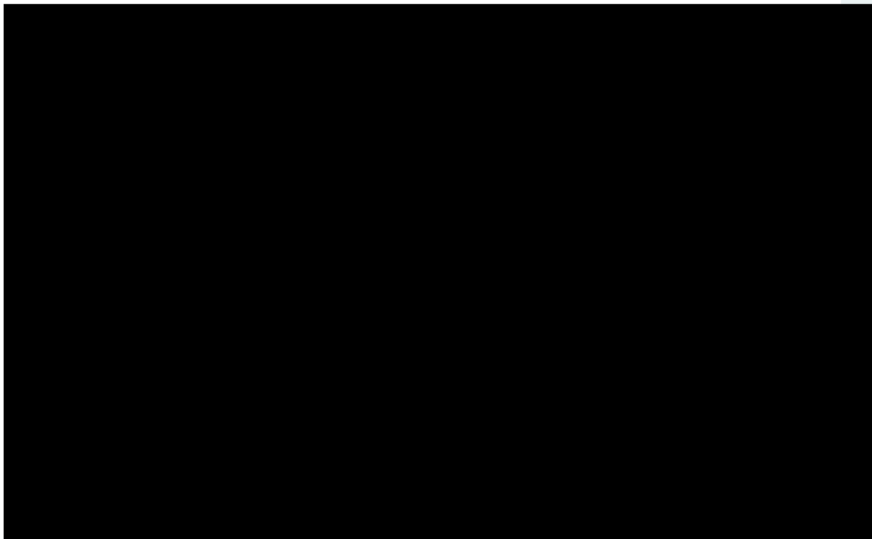[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
55% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 35.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
96% (for the corresponding app developer).

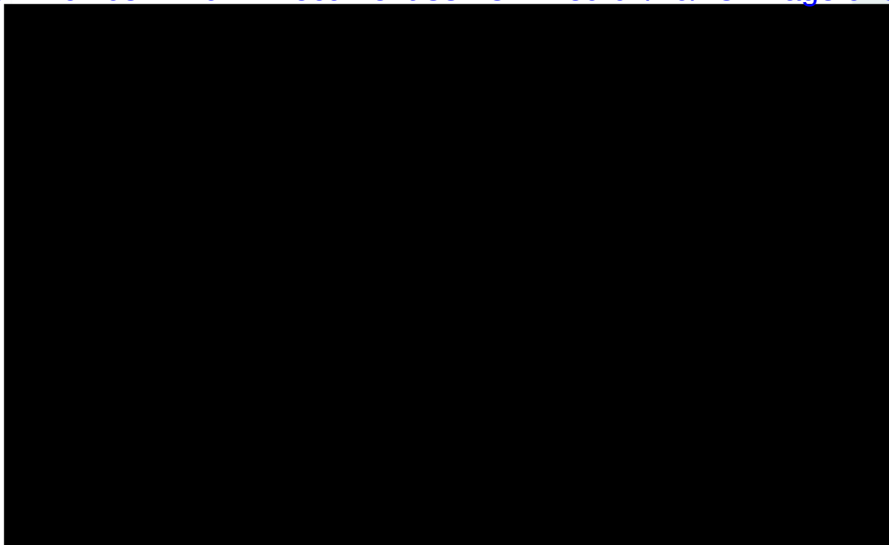Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 36.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
74% (for the corresponding app developer).

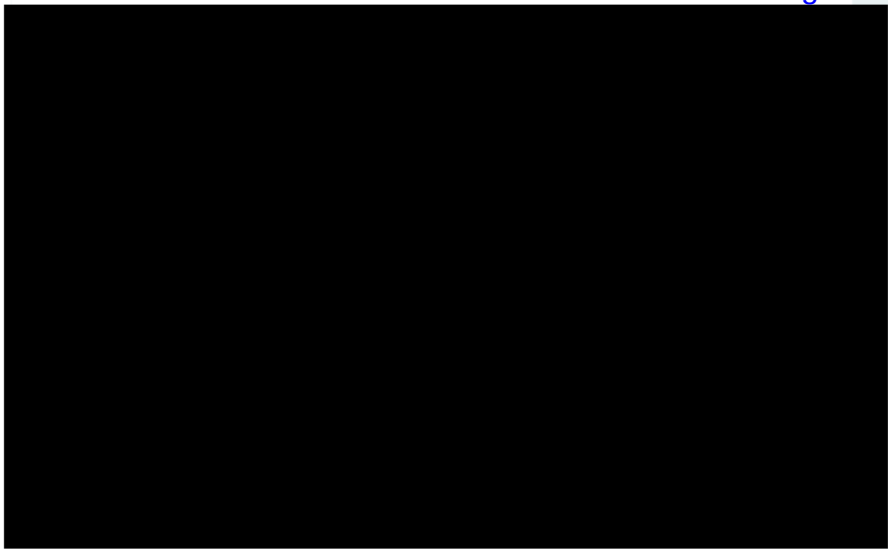Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 37.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 38.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
90% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 40.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
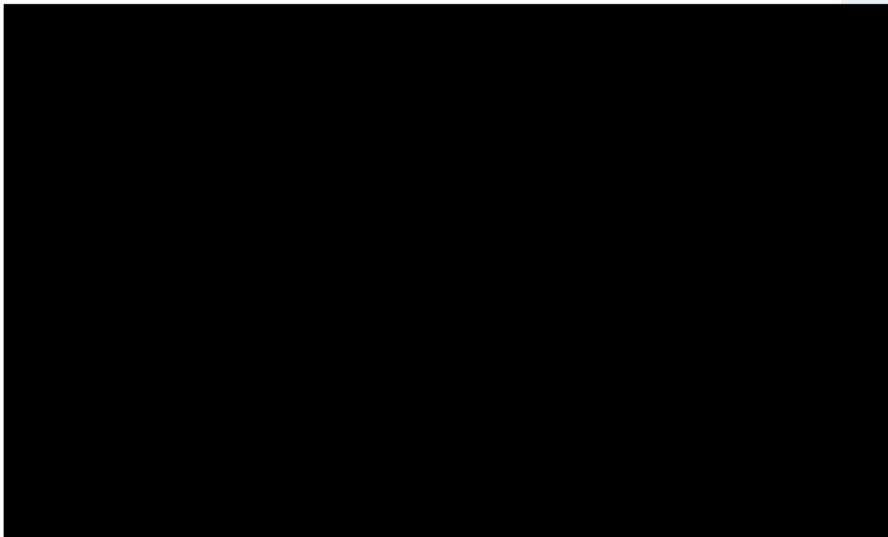[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
39% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 41.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
72% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 42.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
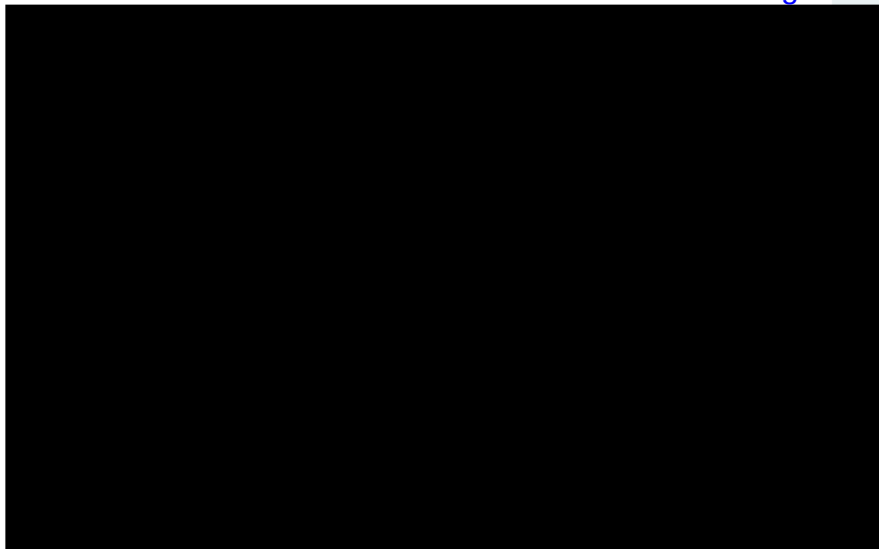[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category); 68% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 43.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
89% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 44.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
90% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 45.
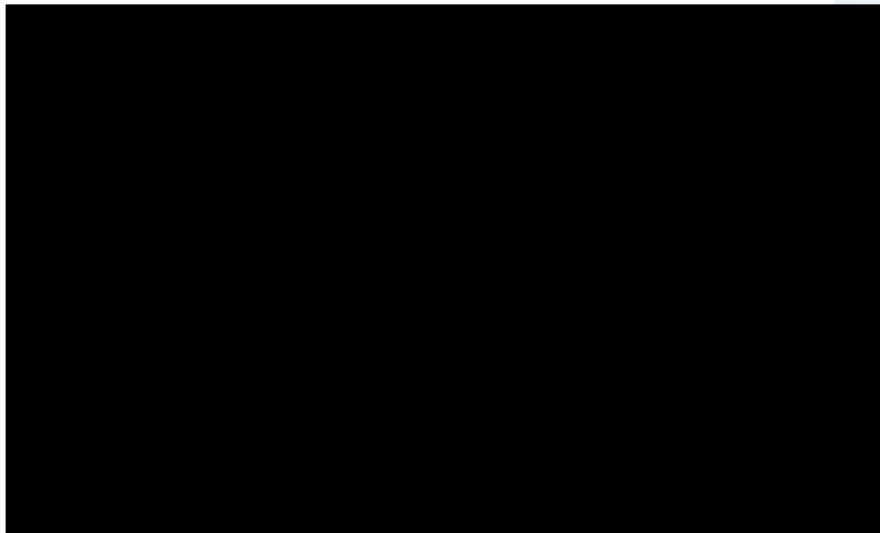[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
72% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 46.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
81% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 47.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
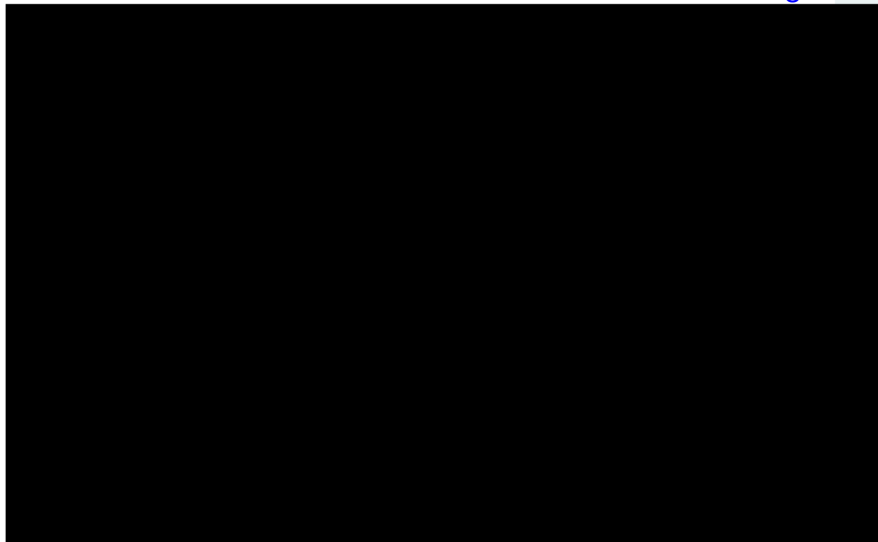[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
94% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 48.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
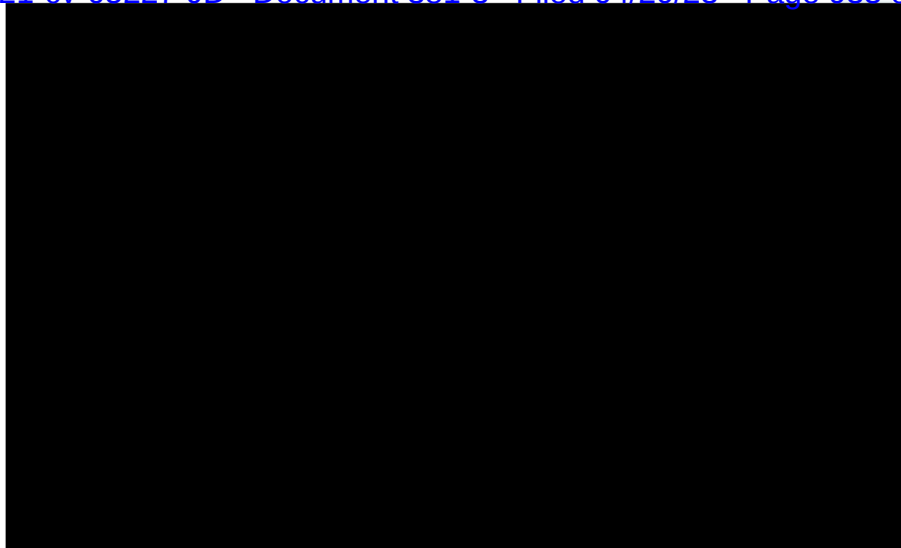74% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 49.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
55% (for the corresponding app developer).

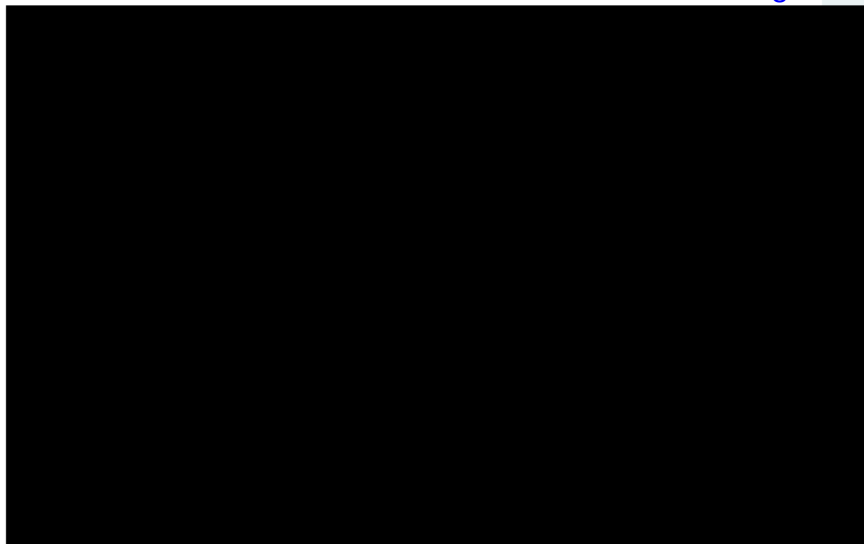Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 51.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
74% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 52.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category); 74% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 53.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
72% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 54.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
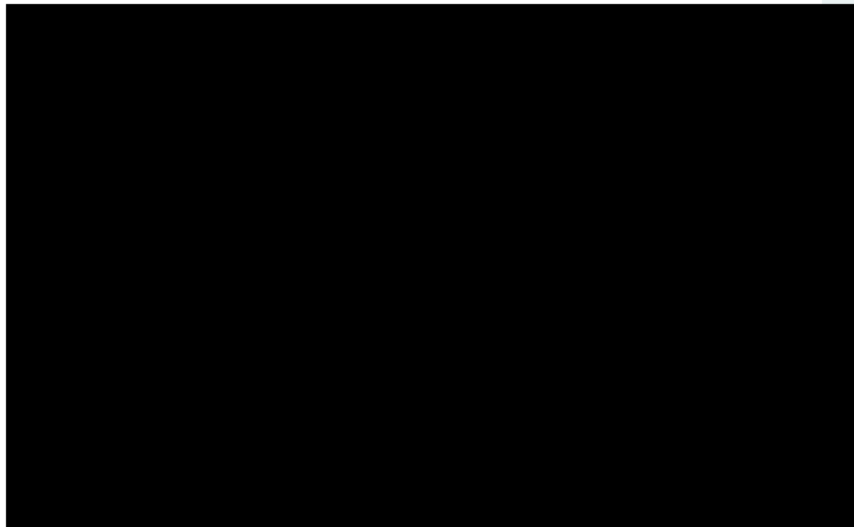[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category); 85% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 55.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
74% (for the corresponding app developer).

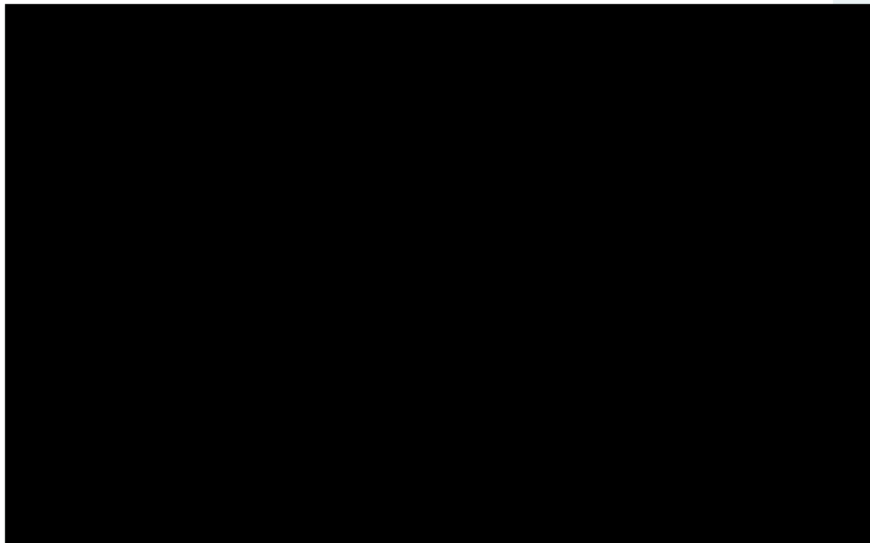Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 56.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
95% (for the corresponding app developer).

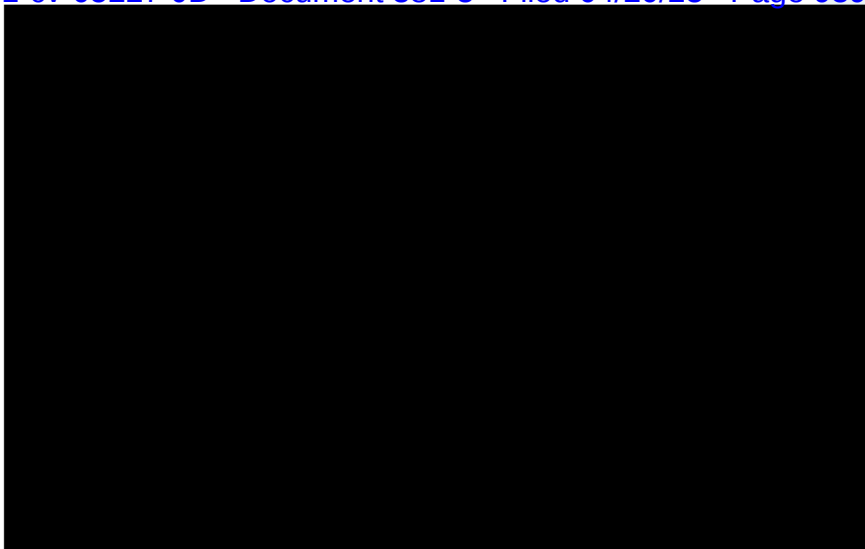Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 57.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
95% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 58.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
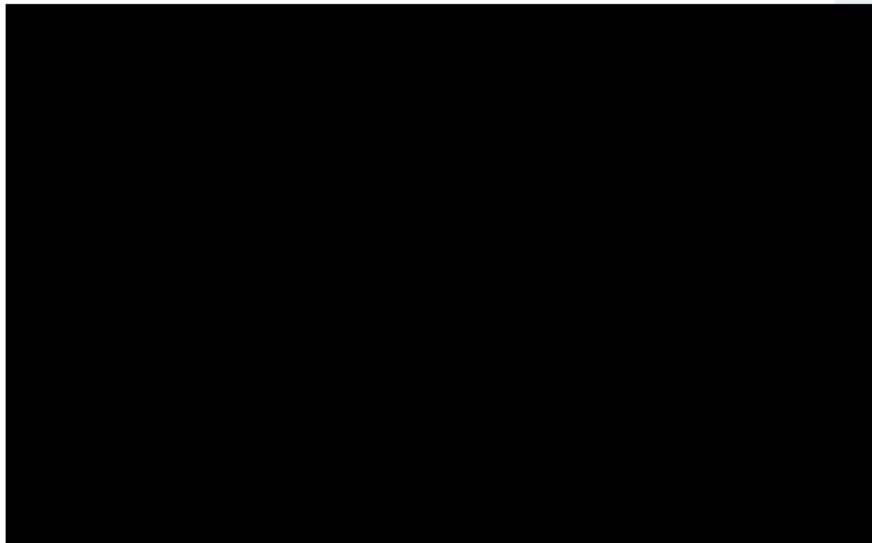96% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 59.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
94% (for the corresponding app developer).

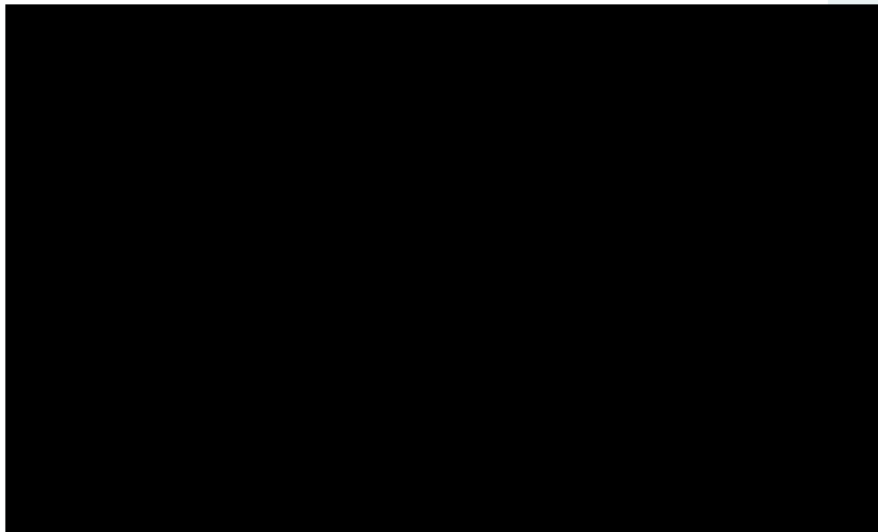Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 60.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
39% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 61.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
87% (for the corresponding app developer).

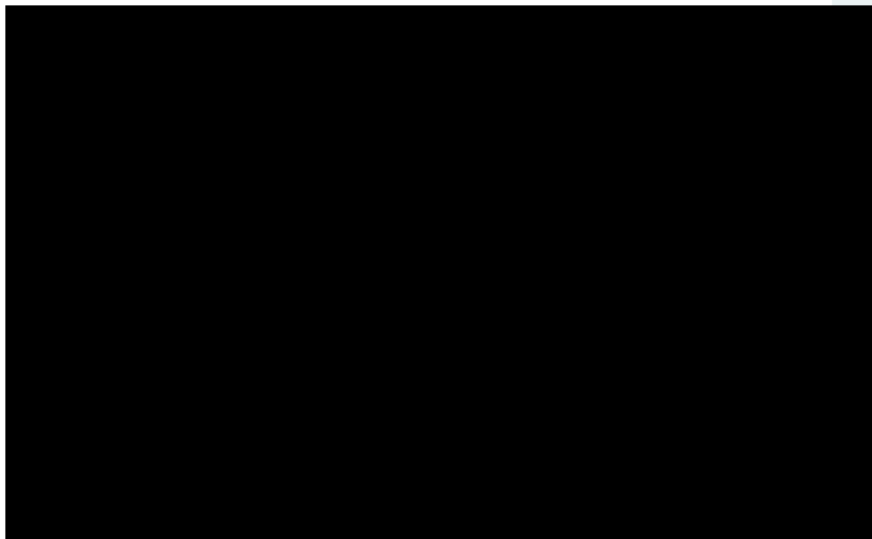Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 62.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
94% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 63.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
81% (for the corresponding app developer).
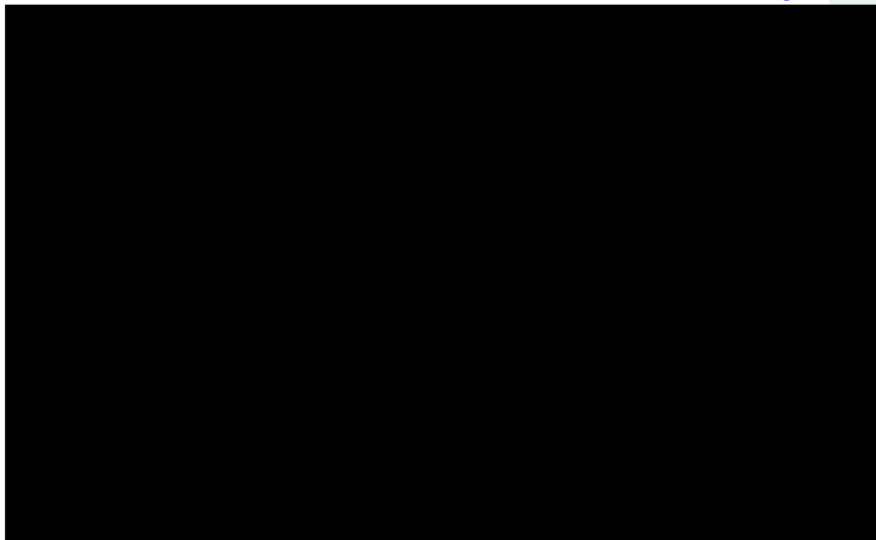
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 64.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
94% (for the corresponding app developer).
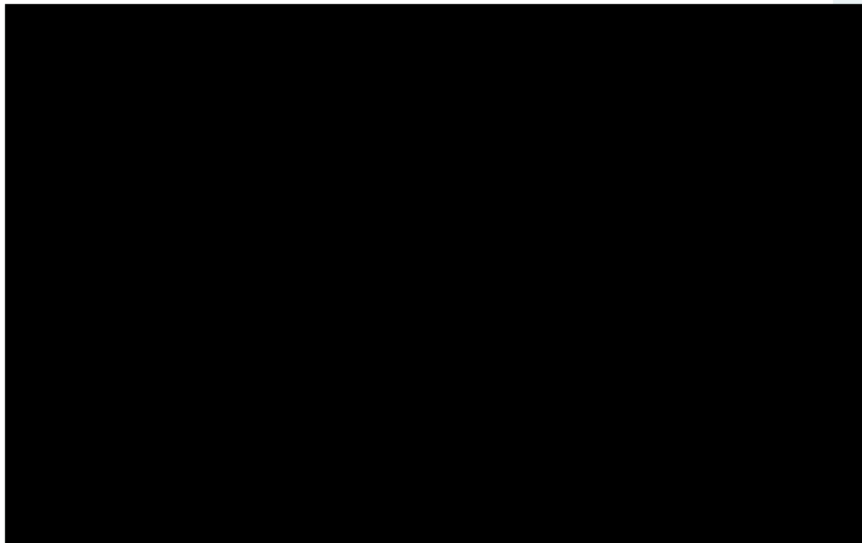
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 65.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
87% (for the corresponding app developer).
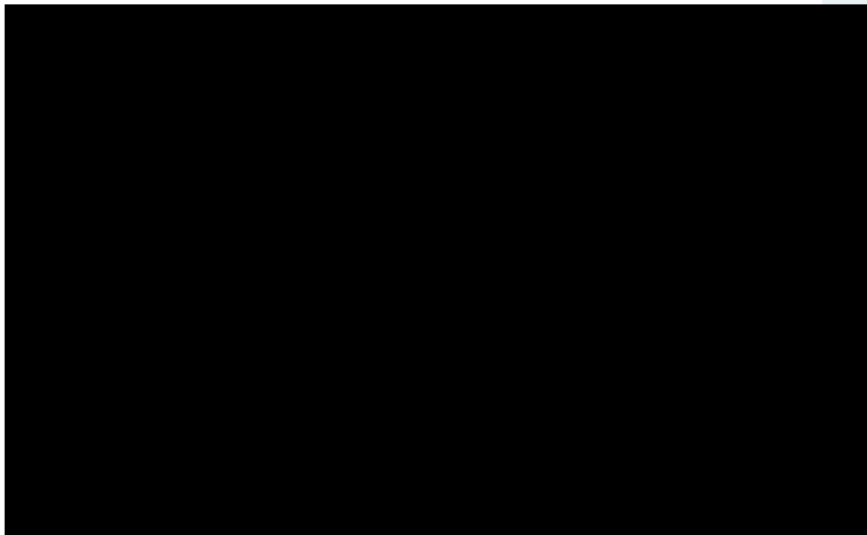
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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 66.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
39% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 67.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
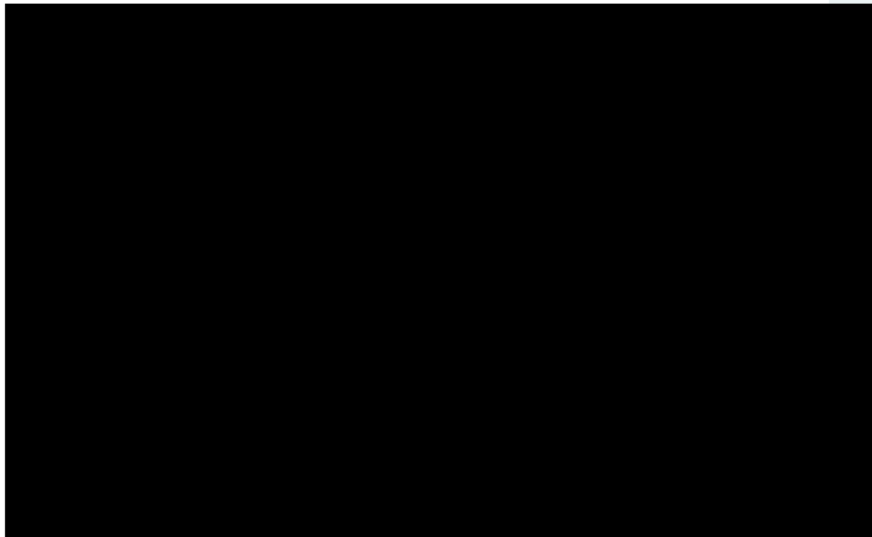39% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 68.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
87% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 69.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
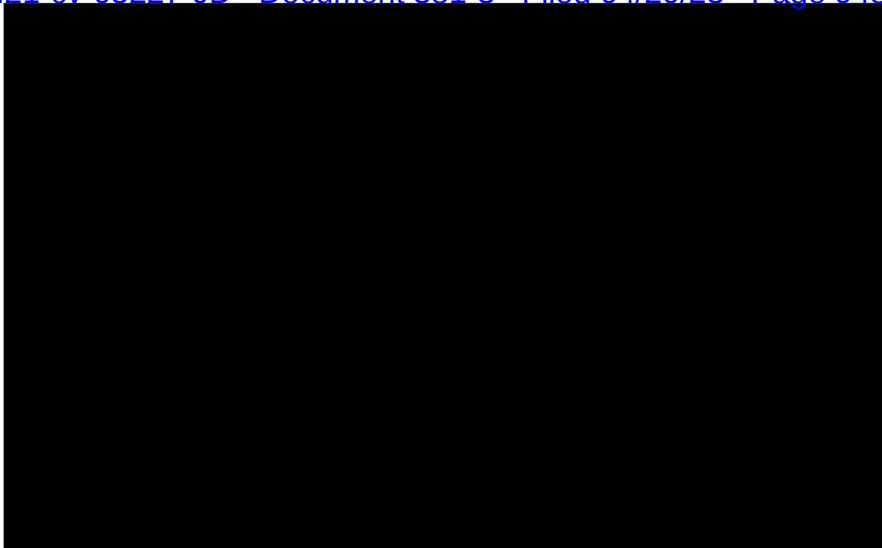87% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 70.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
39% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 71.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 96% (for the corresponding app developer).
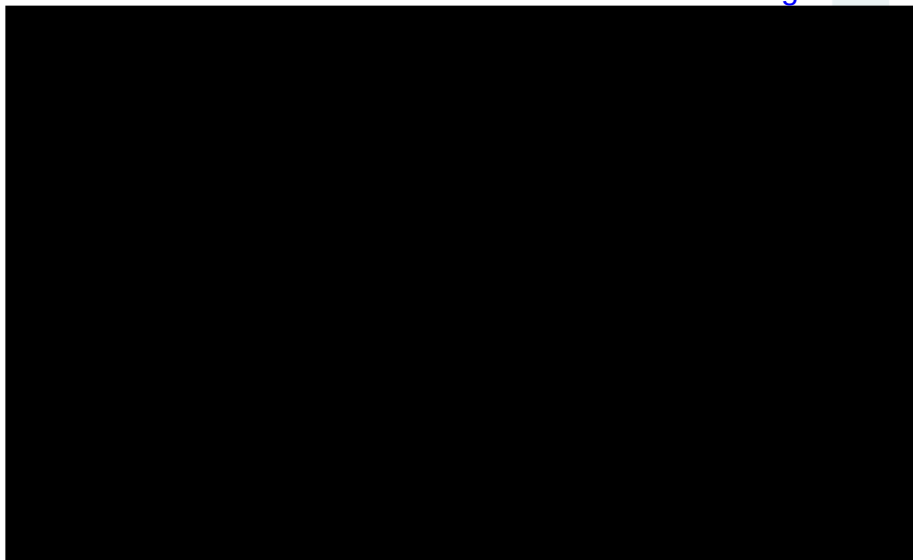
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 72.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 84% (for the corresponding app category);
74% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 73.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
87% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 74.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 75.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 76.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category); 94% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 77.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
74% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 78.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
96% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 79.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category); 94% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 80.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
94% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 81.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
95% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 82.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category);
90% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 83.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
92% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 84.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 96% (for the corresponding app category); 95% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 85.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
95% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 86.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
84% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 87.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
85% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 88.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
88% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 90.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 94% (for the corresponding app category); 89% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 91.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
95% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 92.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
95% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 93.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 57% (for the corresponding app category);
39% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 94.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
68% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 95.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
95% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 96.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 90% (for the corresponding app category);
93% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 97.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 89% (for the corresponding app category);
84% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 98.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category);
85% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 99.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 87% (for the corresponding app category);
95% (for the corresponding app developer).

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 100.
[2] Price change before and after July 2021: no change in the list price, no change in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 71% (for the corresponding app category);
94% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 16.
[2] Price change before and after July 2021: no change in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
55% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 20.
[2] Price change before and after July 2021: no change in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
90% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 39.
[2] Price change before and after July 2021: no change in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
55% (for the corresponding app developer).

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 50.
[2] Price change before and after July 2021: no change in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 81% (for the corresponding app category);
90% (for the corresponding app developer).

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 89.
[2] Price change before and after July 2021: no change in the list price, decrease in the net price.
[3] Pass-through rate predicted by Dr. Singer's approach: 92% (for the corresponding app category); 85% (for the corresponding app developer).

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Exhibit 37a

Average Monthly Product Price and Service Fee Rate for Tinder Subscriptions

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 1.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
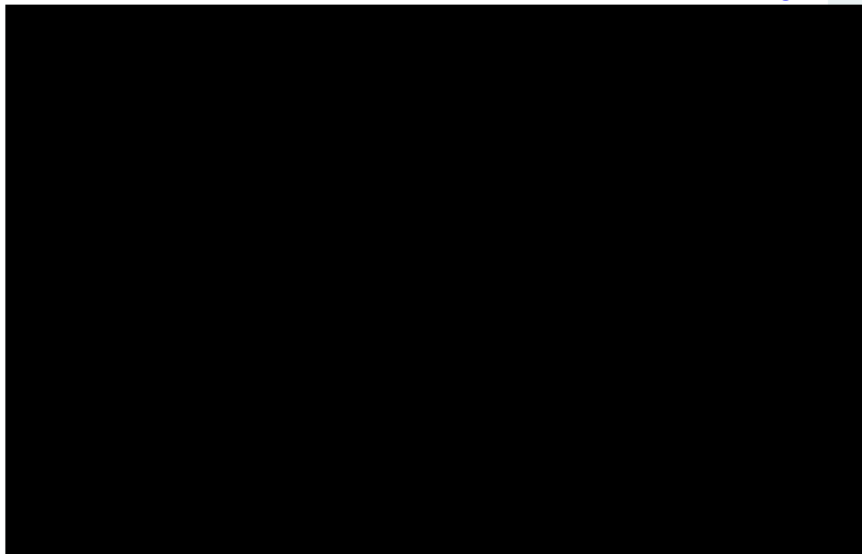[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 2.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
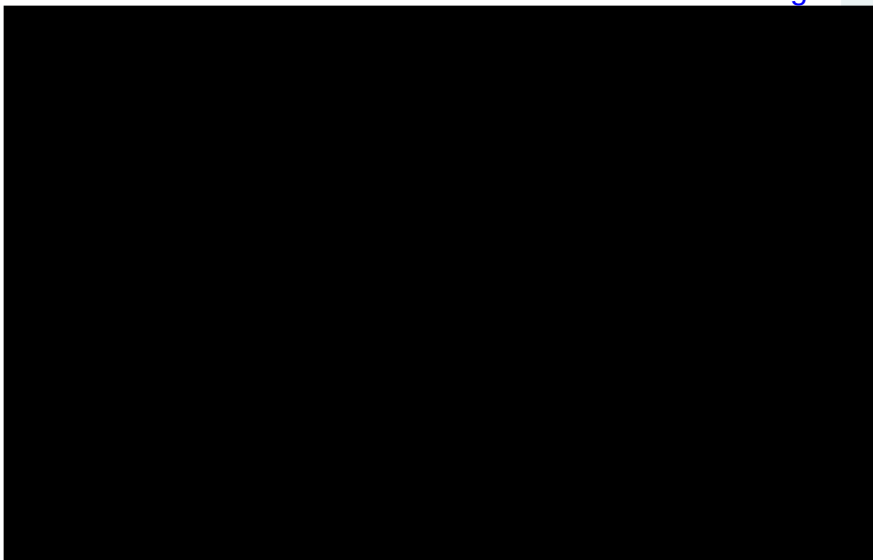[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 9.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
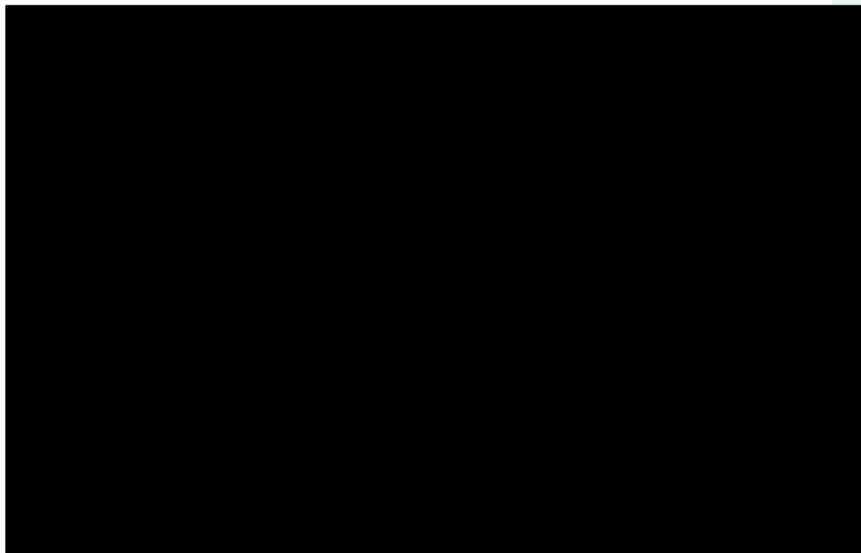[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 10.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 11.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
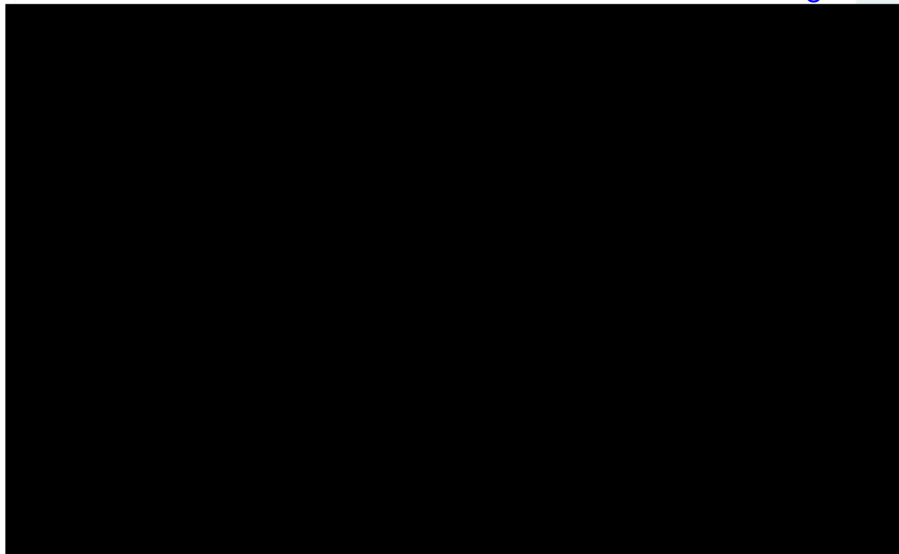[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 12.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 14.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 16.
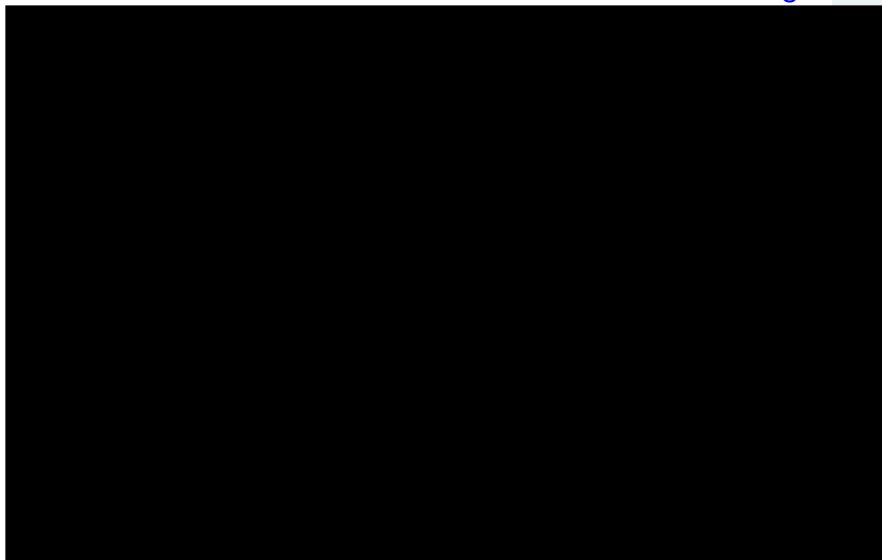[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 19.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 23.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
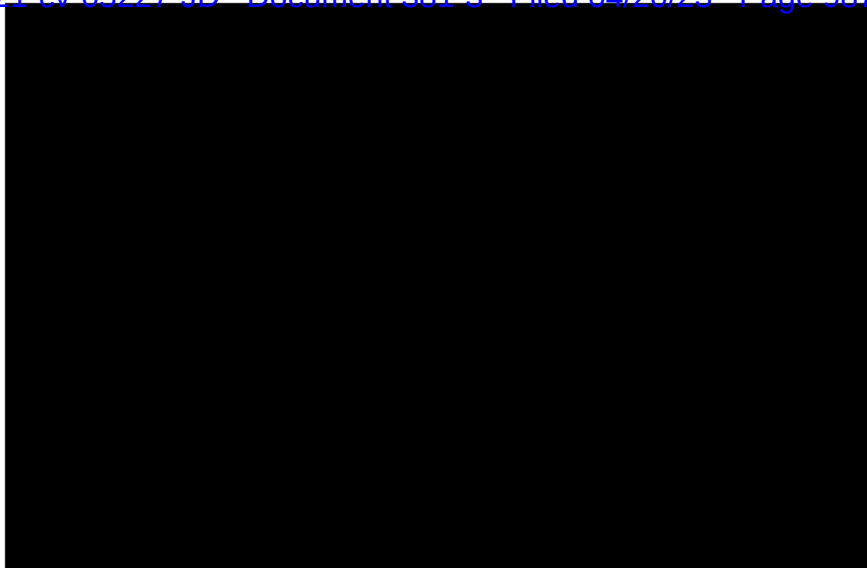[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 25.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

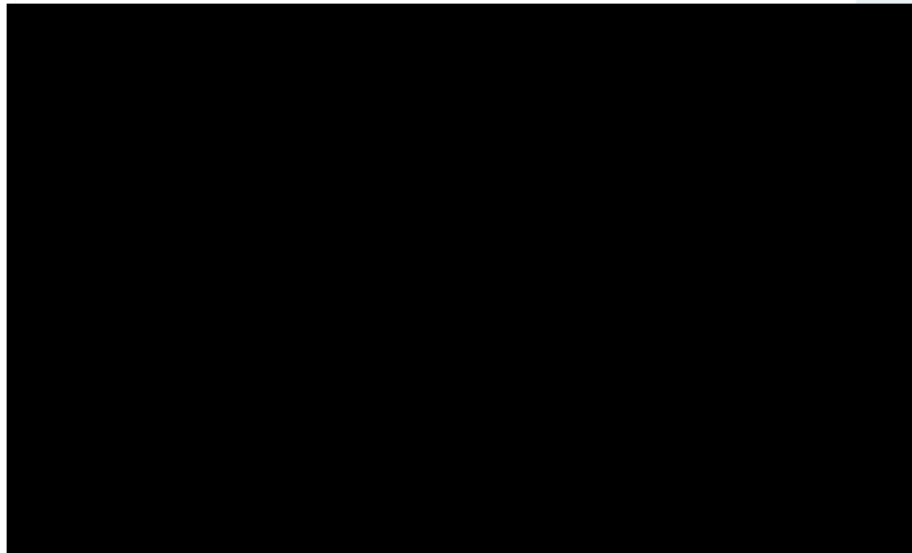Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 28.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 32.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 33.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
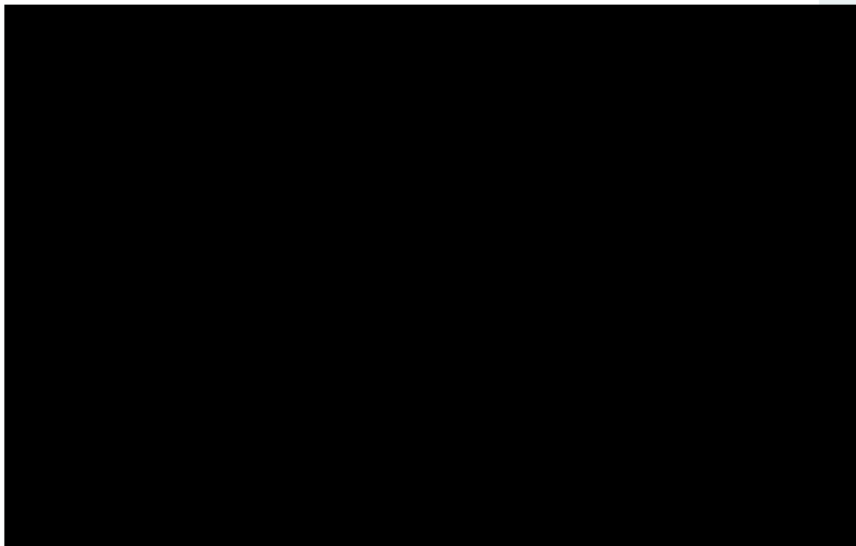[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 34.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
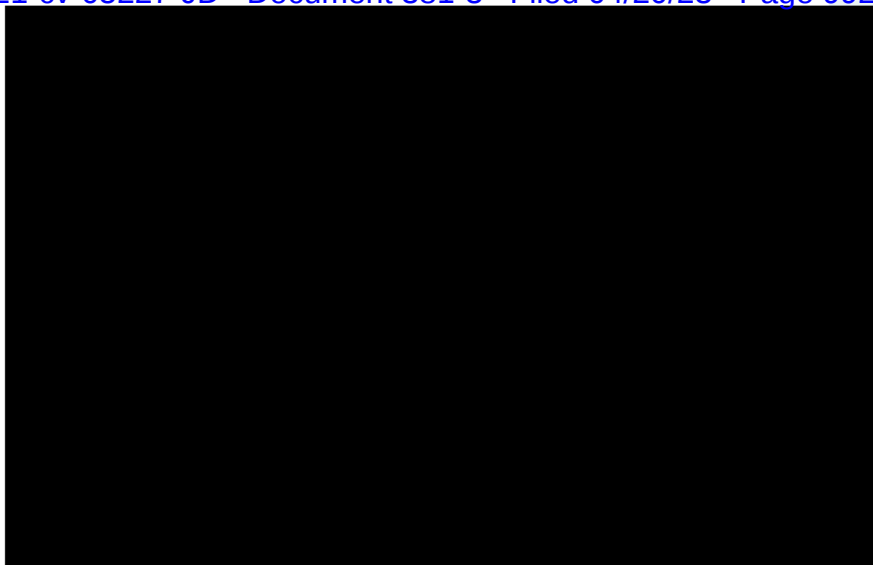
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 35.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 39.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
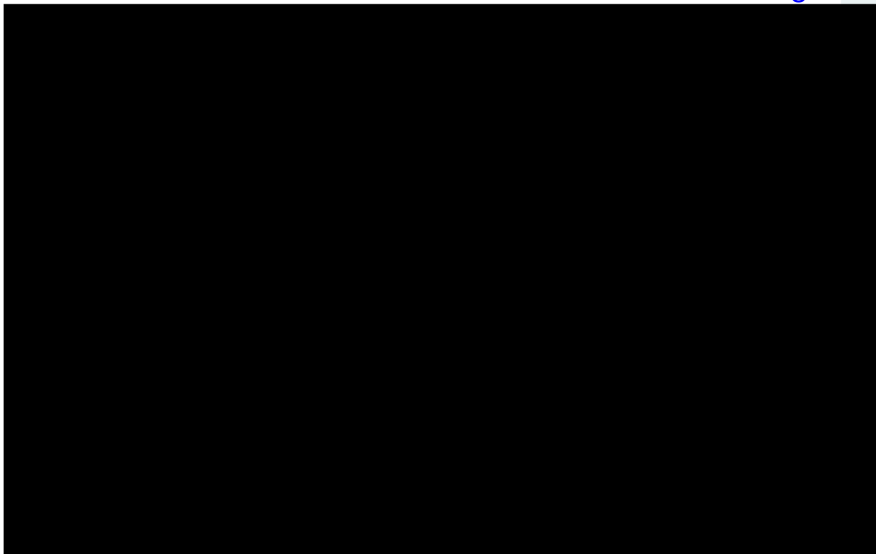[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 40.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 41.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
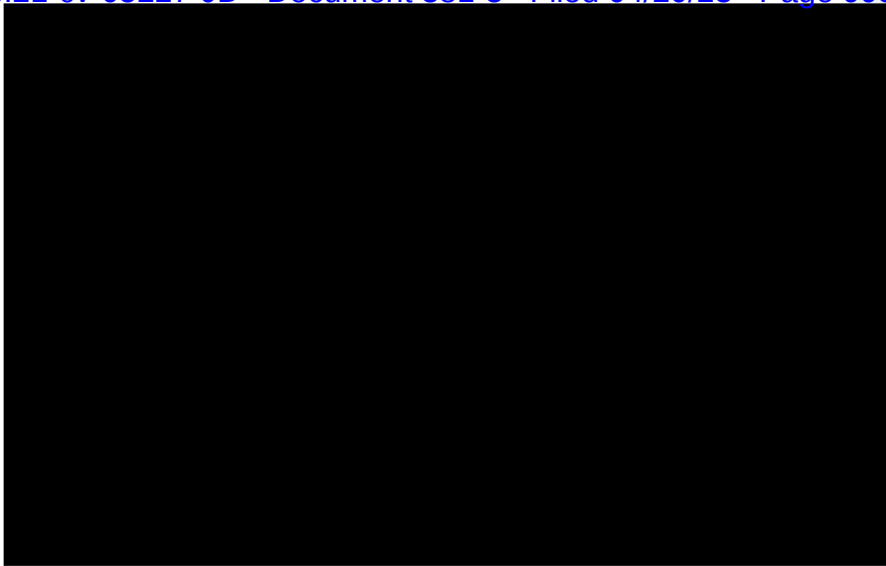
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 43.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
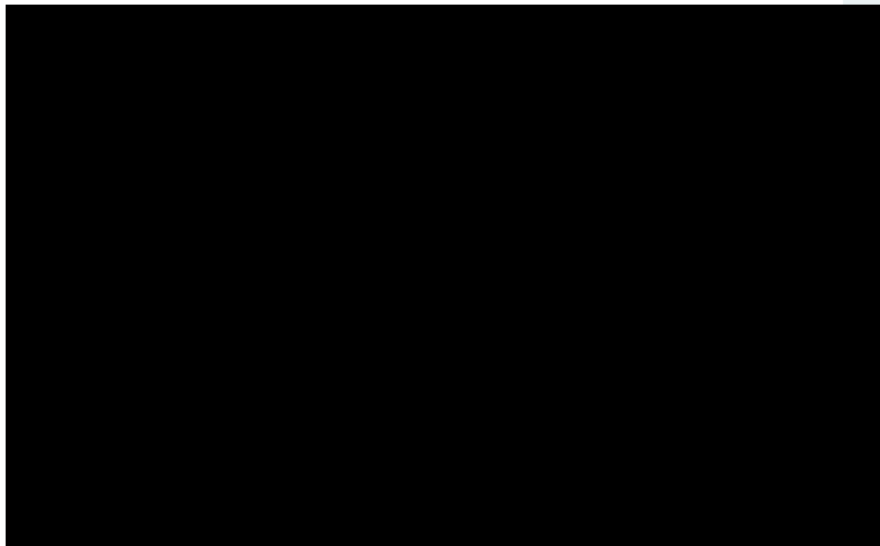
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 44.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 45.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
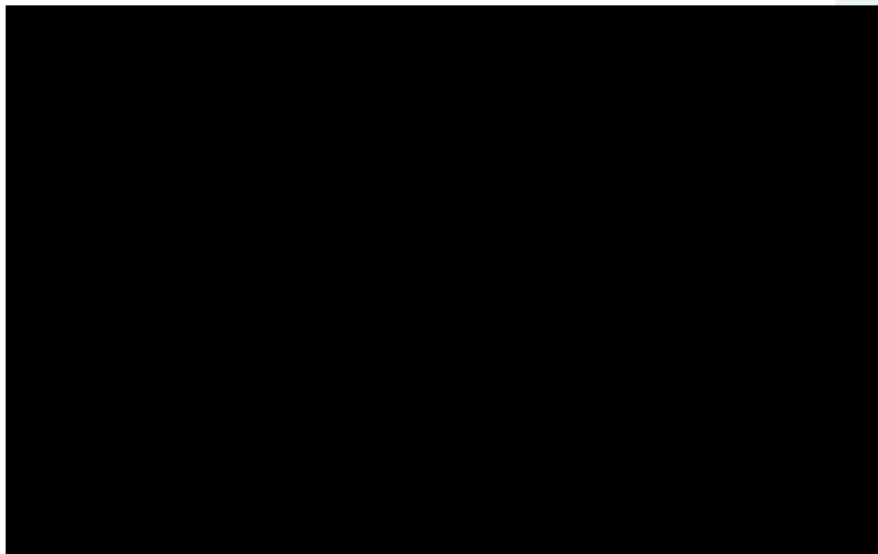
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 47.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
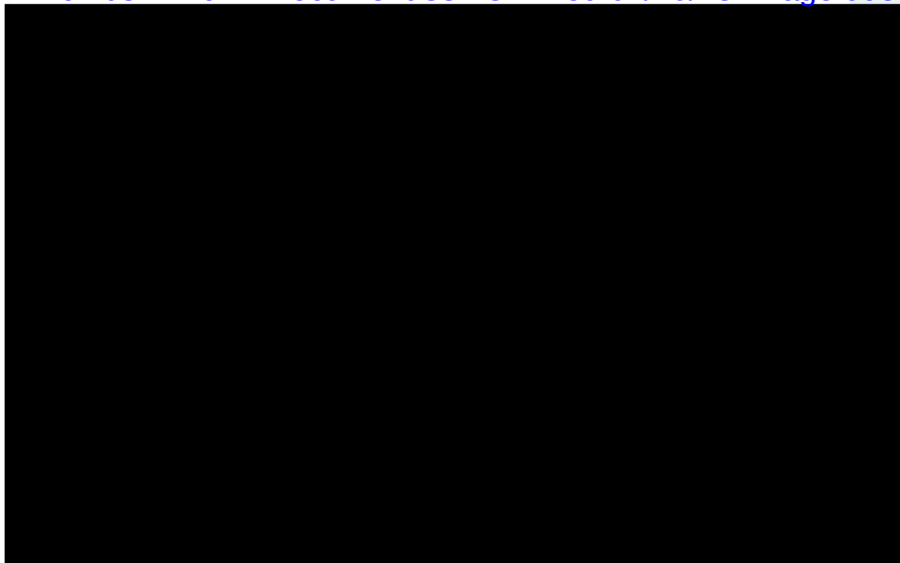
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 48.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 49.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 54.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 55.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 56.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 60.
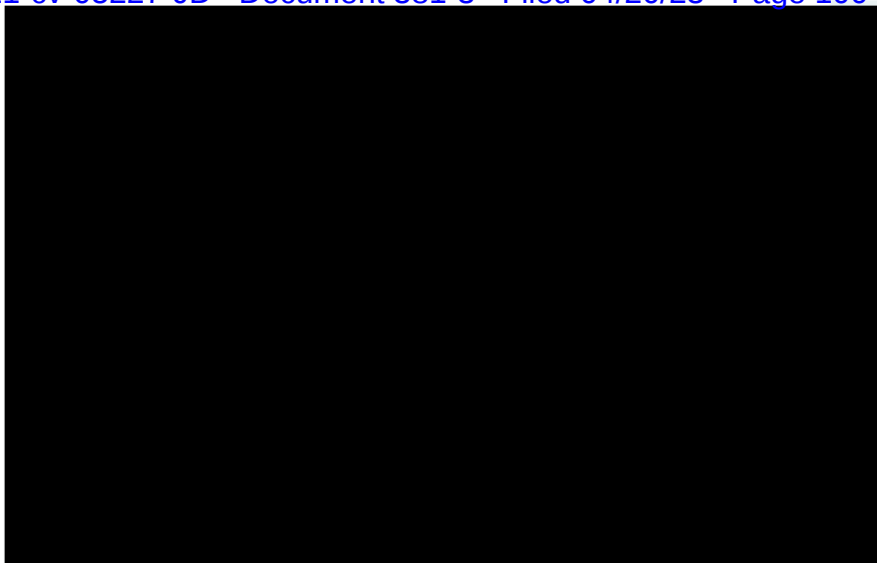[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 61.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
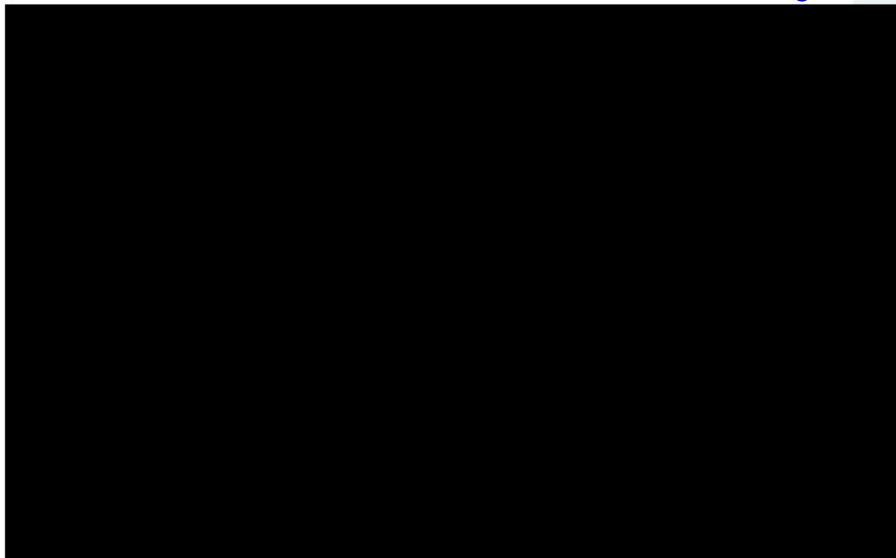
Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 62.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
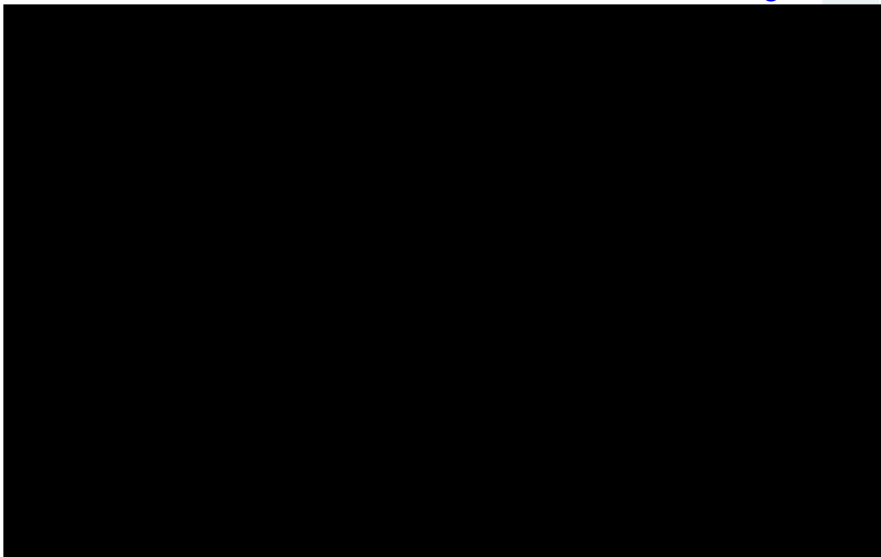
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 63.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

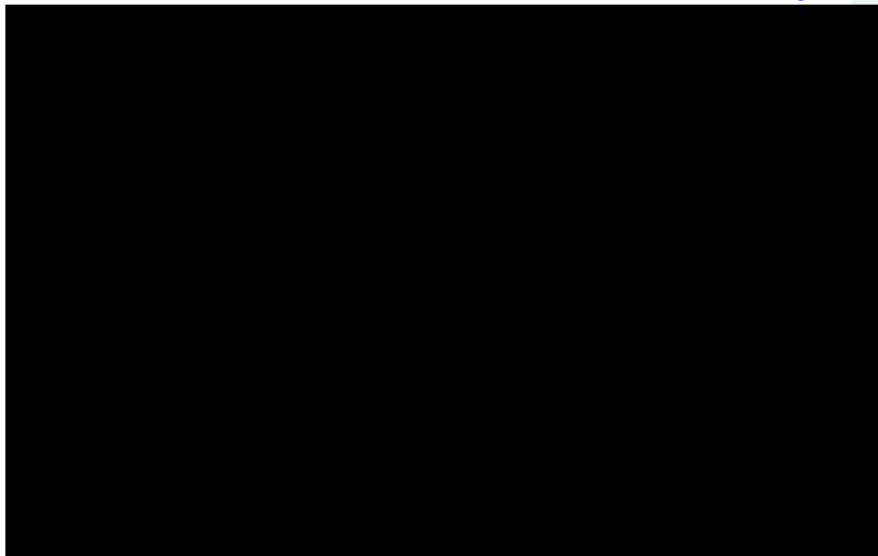Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 64.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 69.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
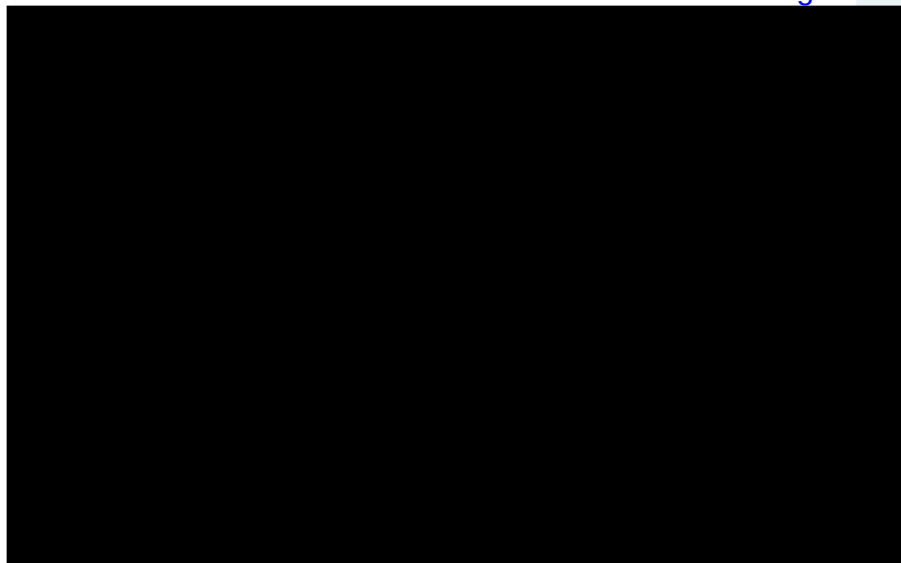[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 73.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 74.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
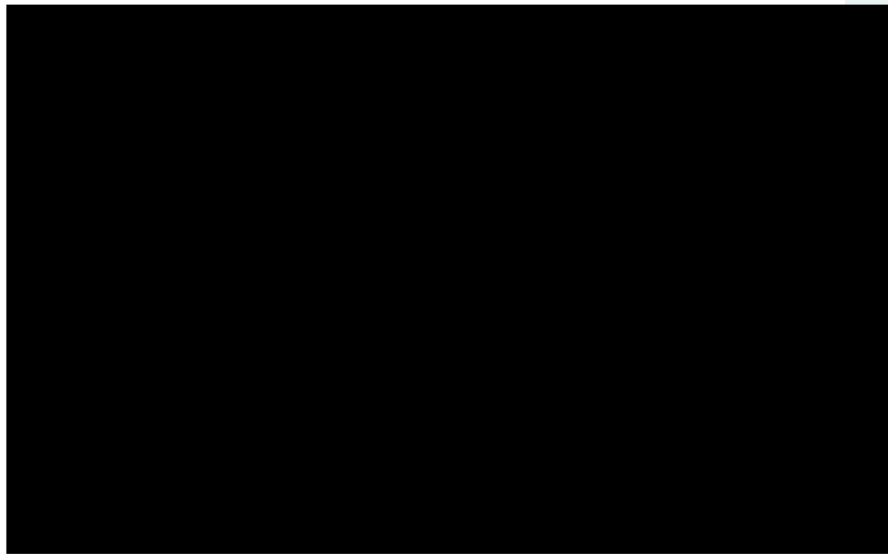
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 76.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

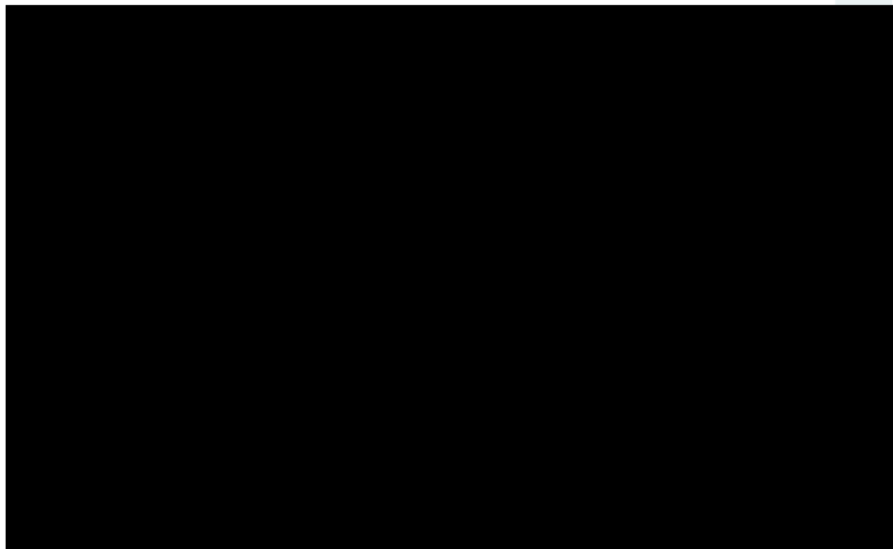Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 78.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 80.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 82.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 83.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 87.
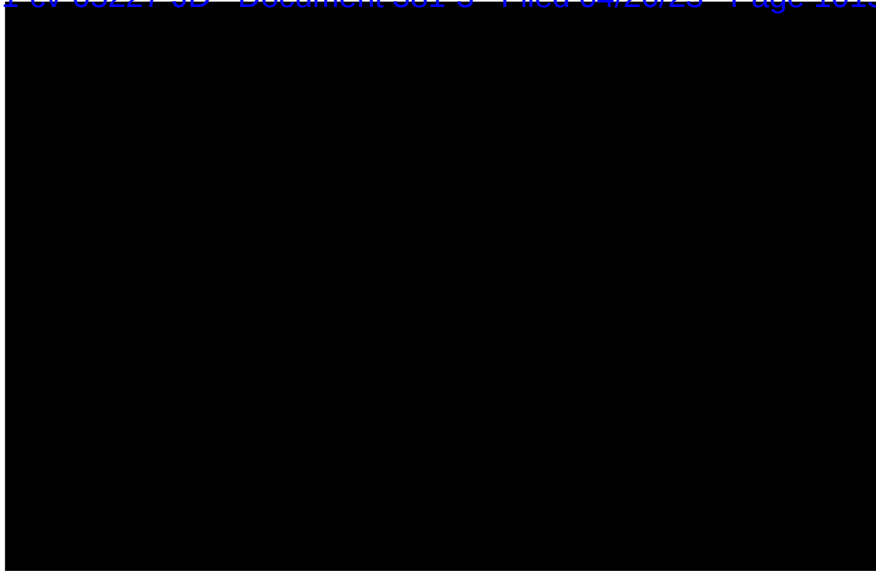[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 88.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 91.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 94.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
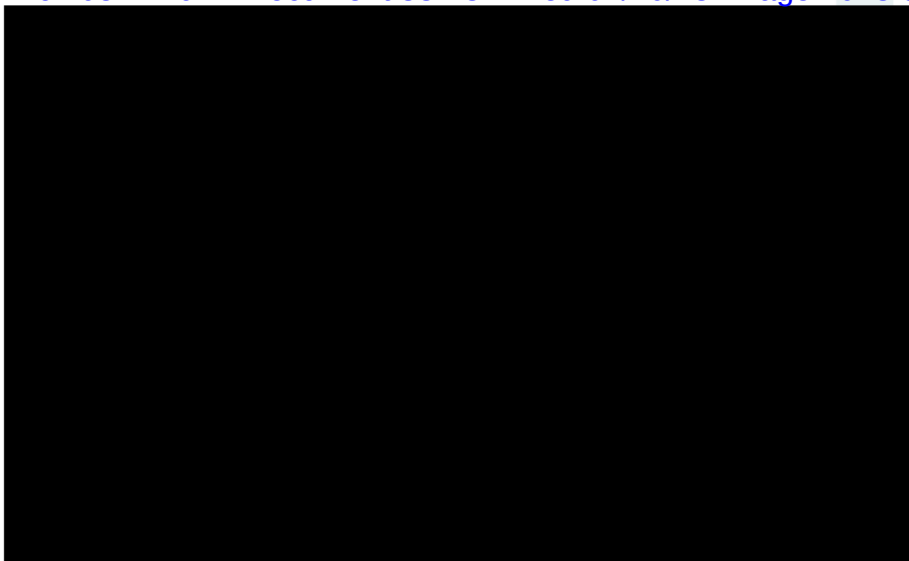[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 95.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
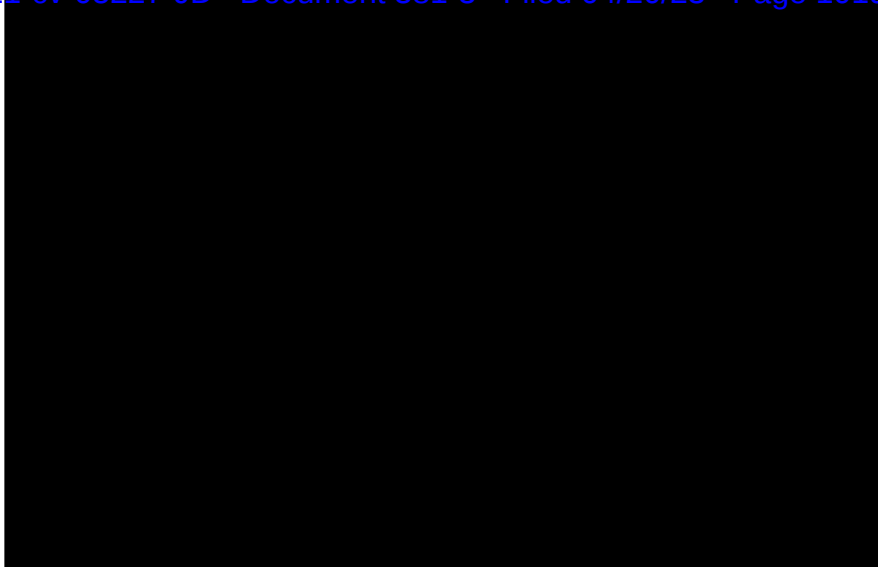
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 97.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 98.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 3.
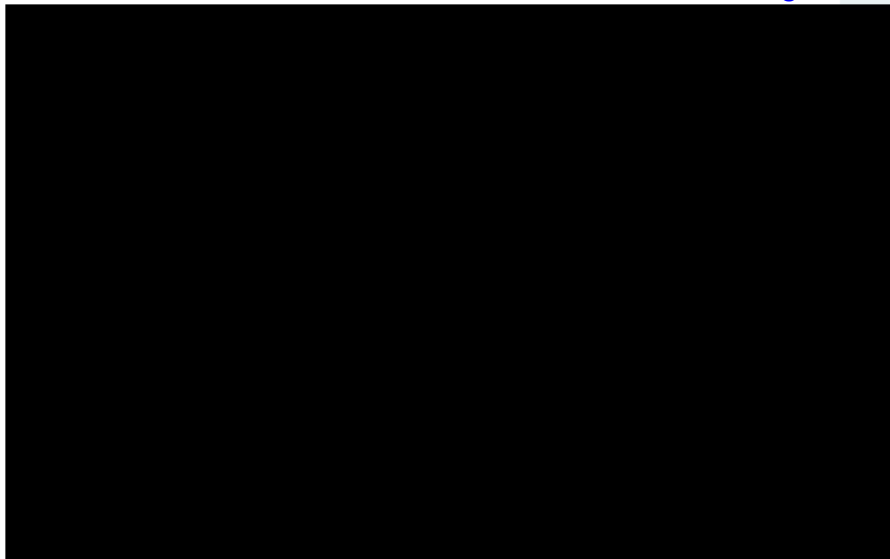[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 4.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 5.
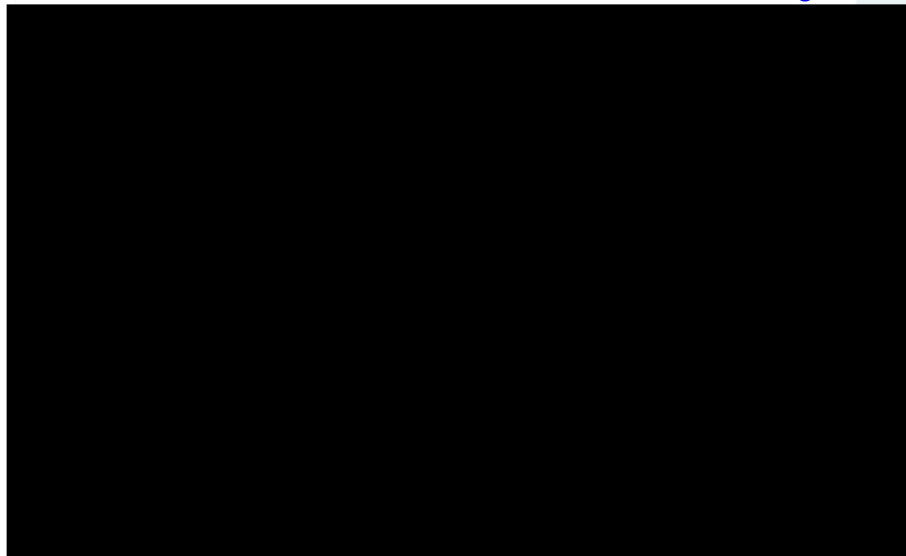[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 6.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
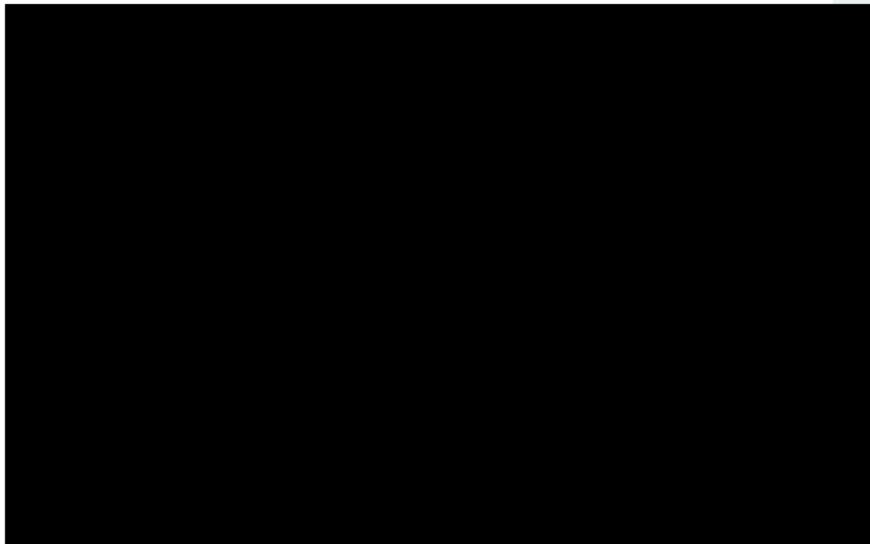
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 7.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 8.
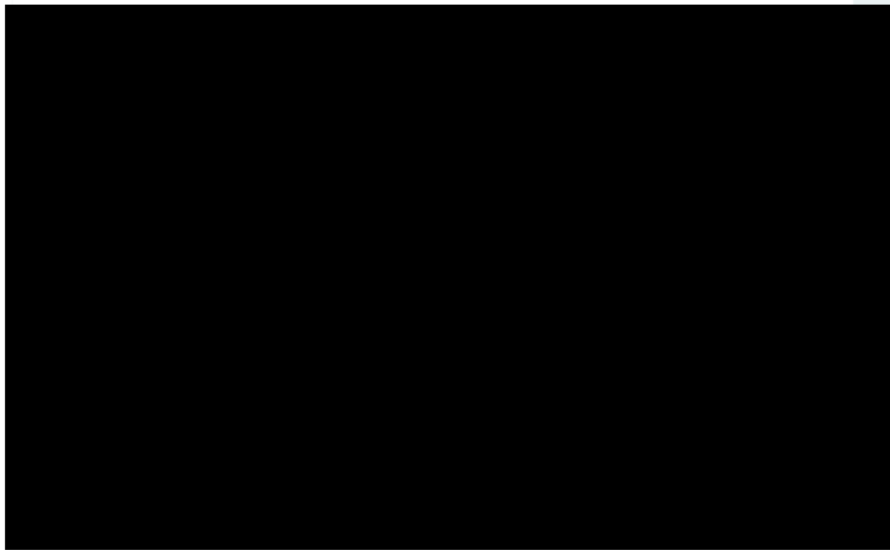[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 13.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 15.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
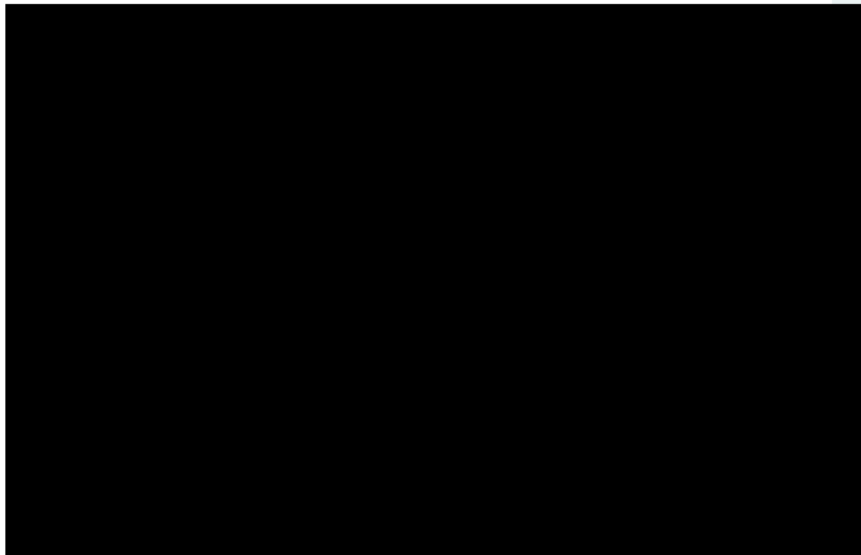
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 17.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
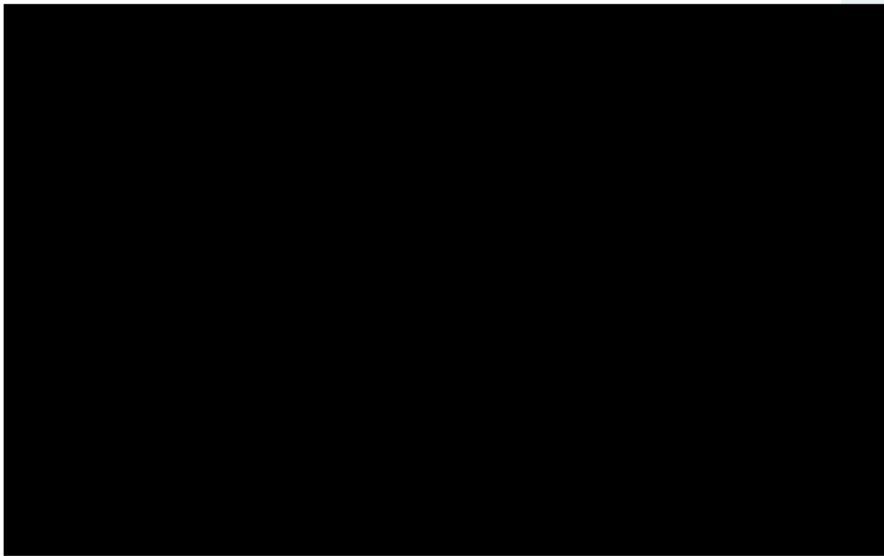
Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 18.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 20.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
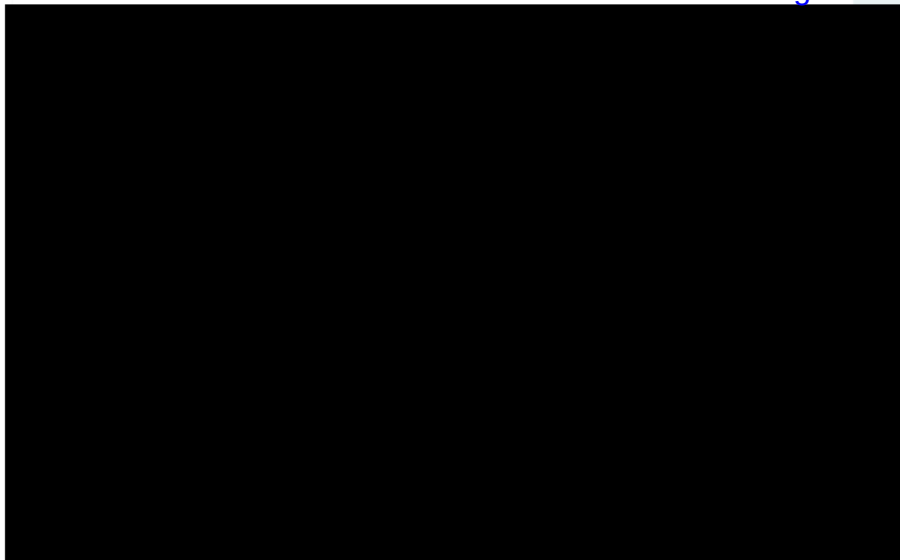[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 21.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 22.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 24.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
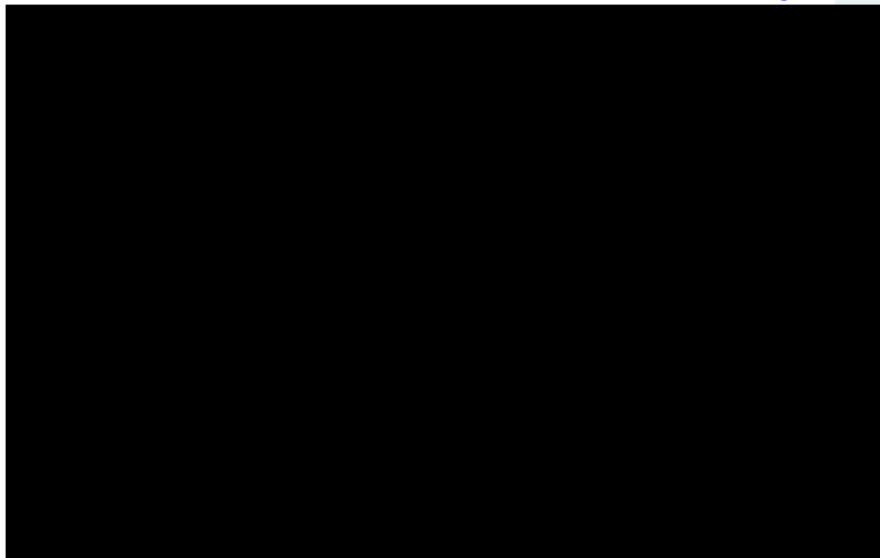
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 26.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
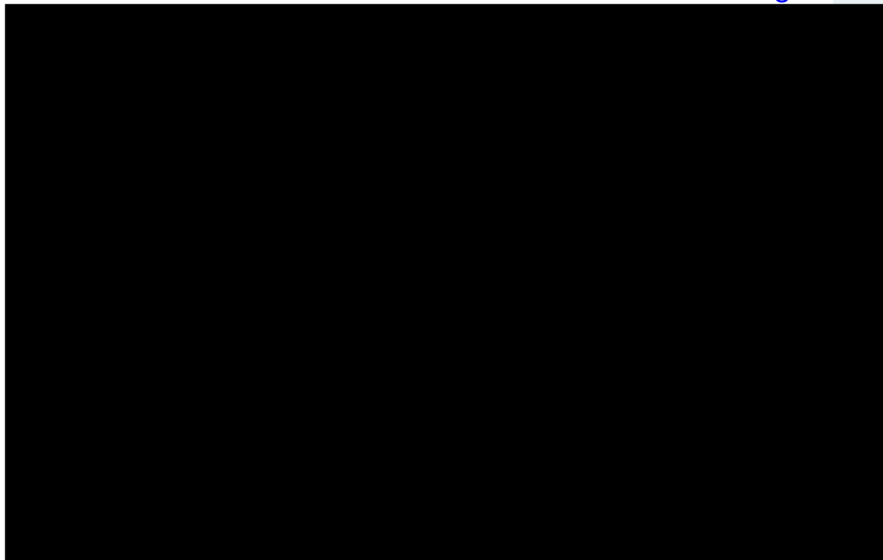
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 27.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 29.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
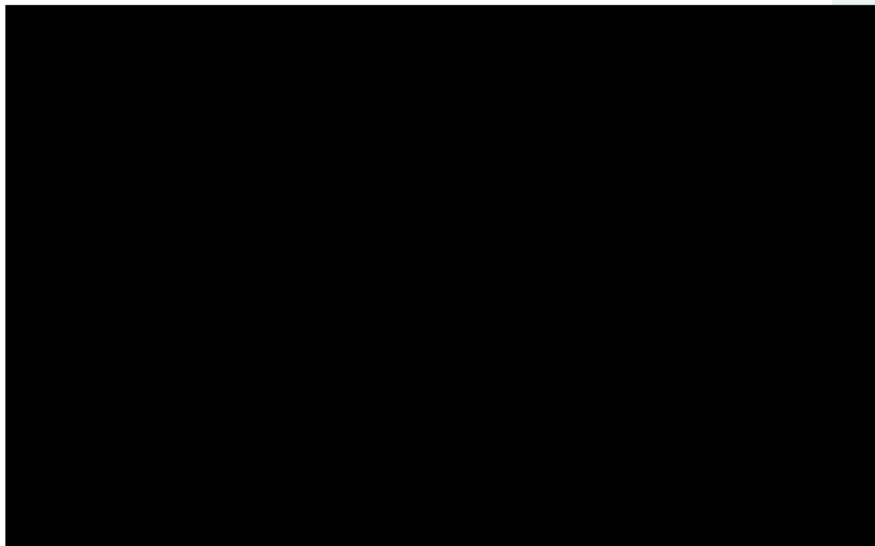[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 30.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 31.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
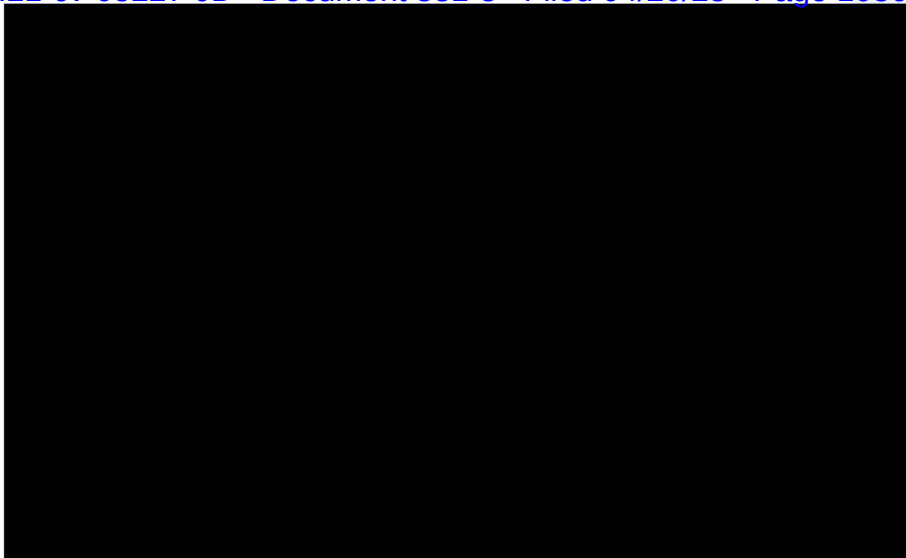
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 36.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
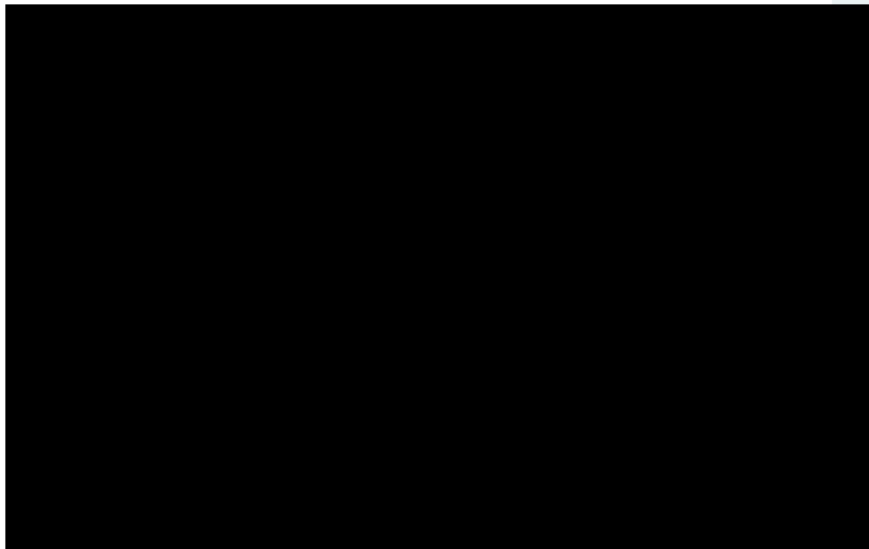
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 37.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
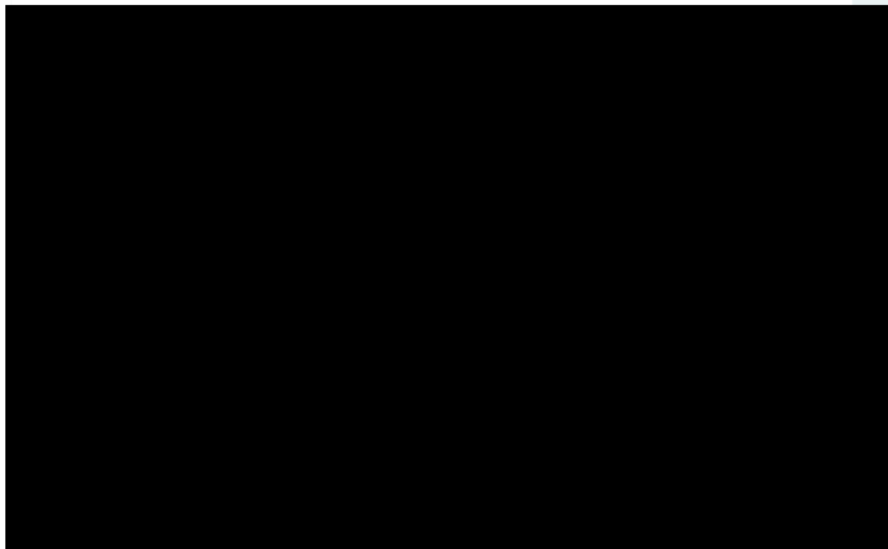
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 38.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 42.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
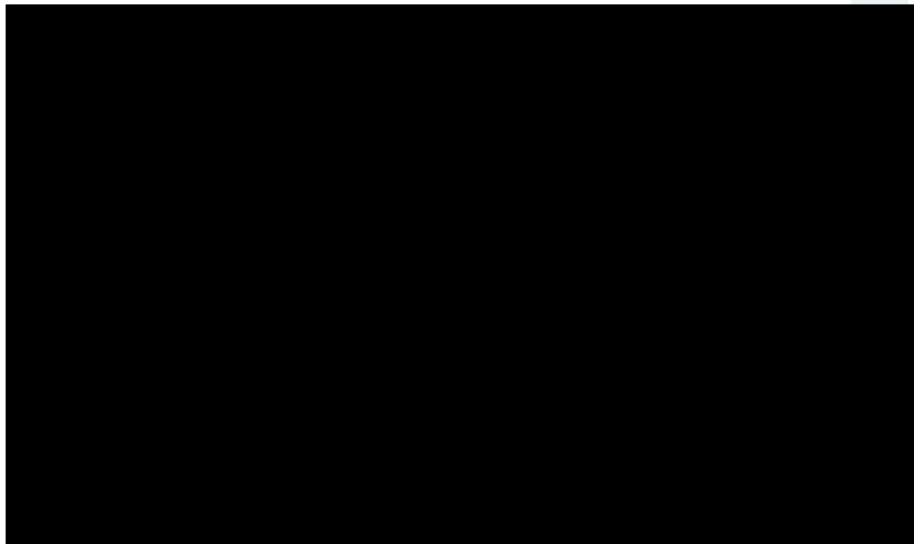
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 46.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
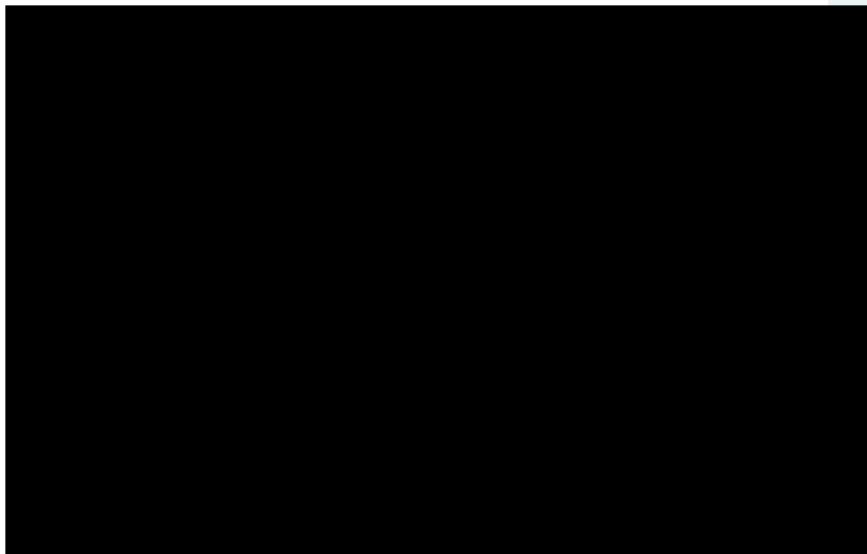
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 50.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 51.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
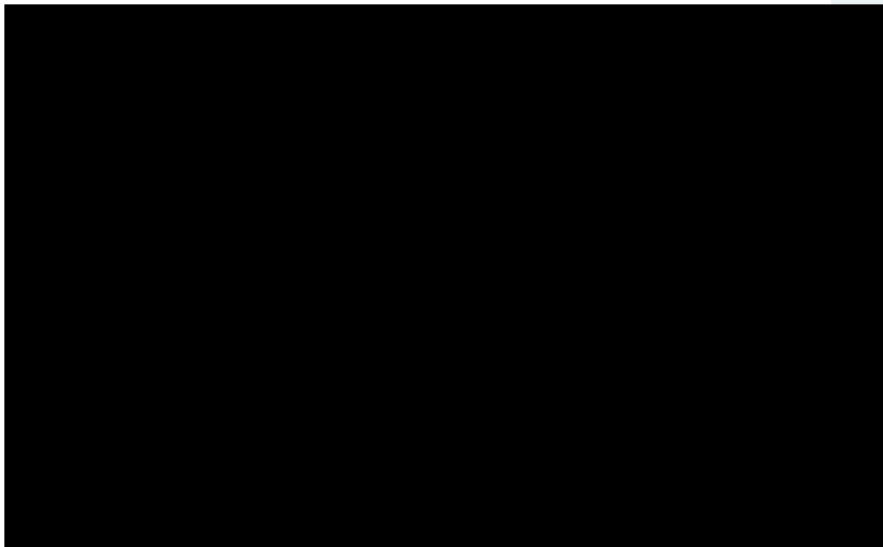
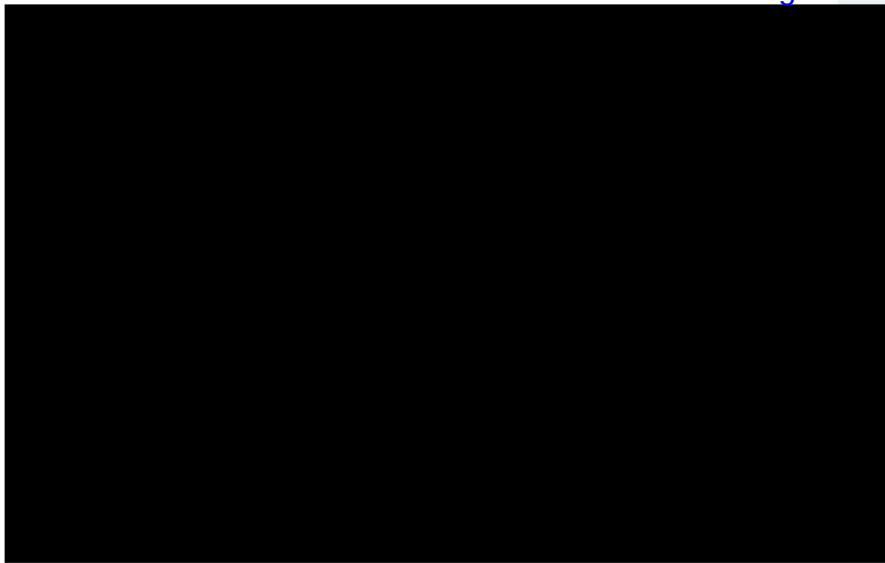Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 52.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 58.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 59.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
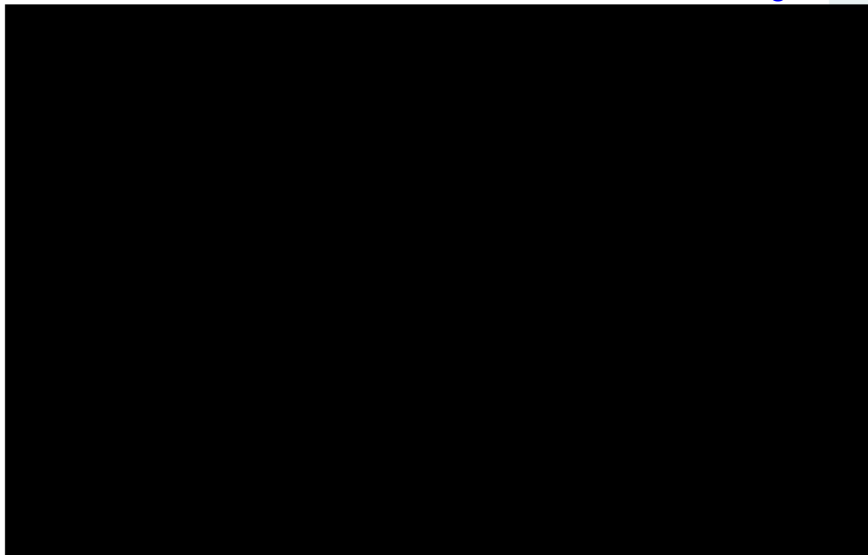[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 66.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
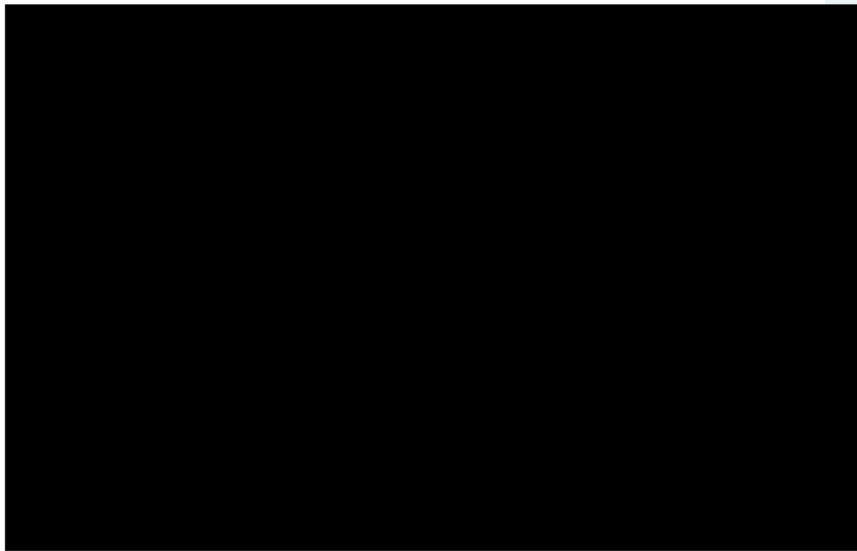
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 67.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

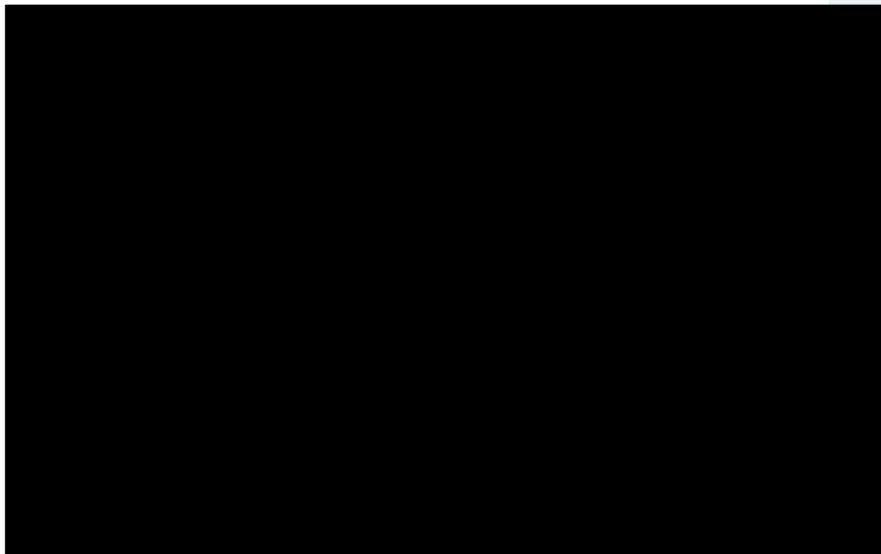Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 68.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 70.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
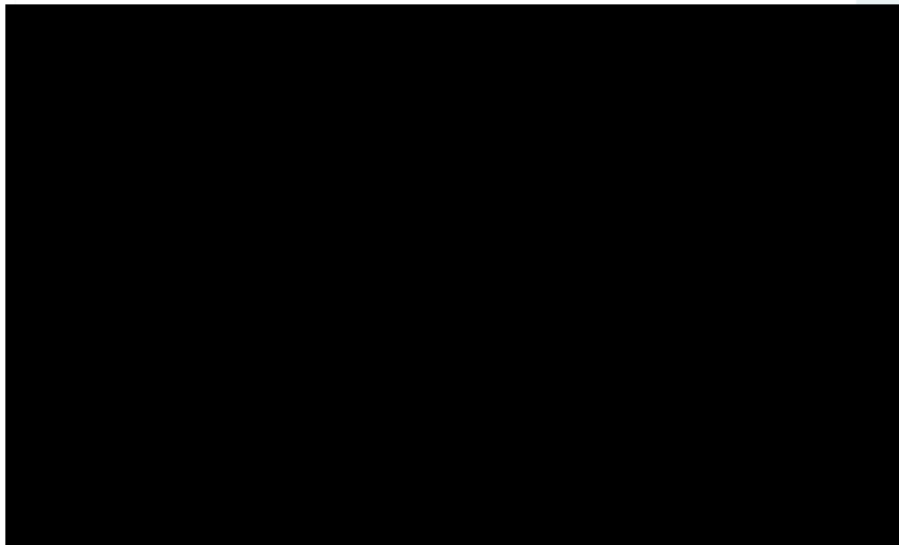
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 71.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

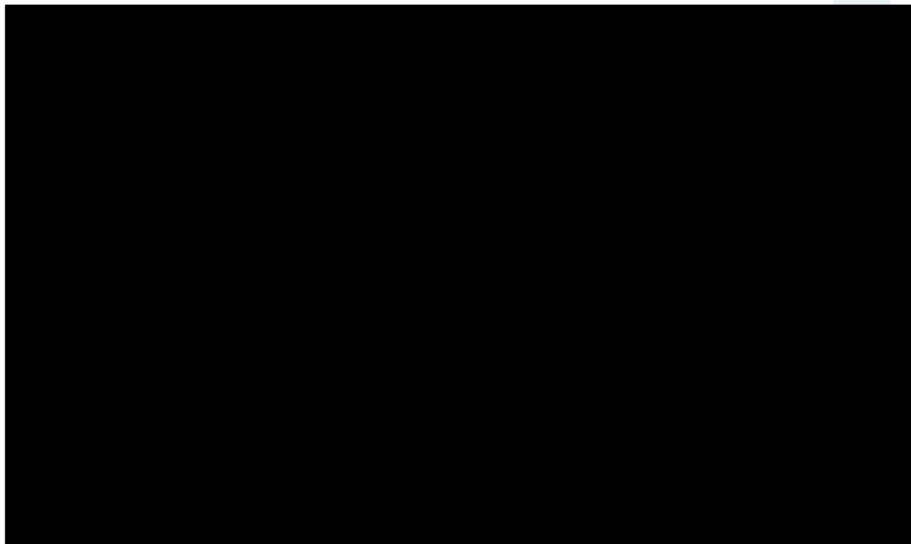Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 72.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 75.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

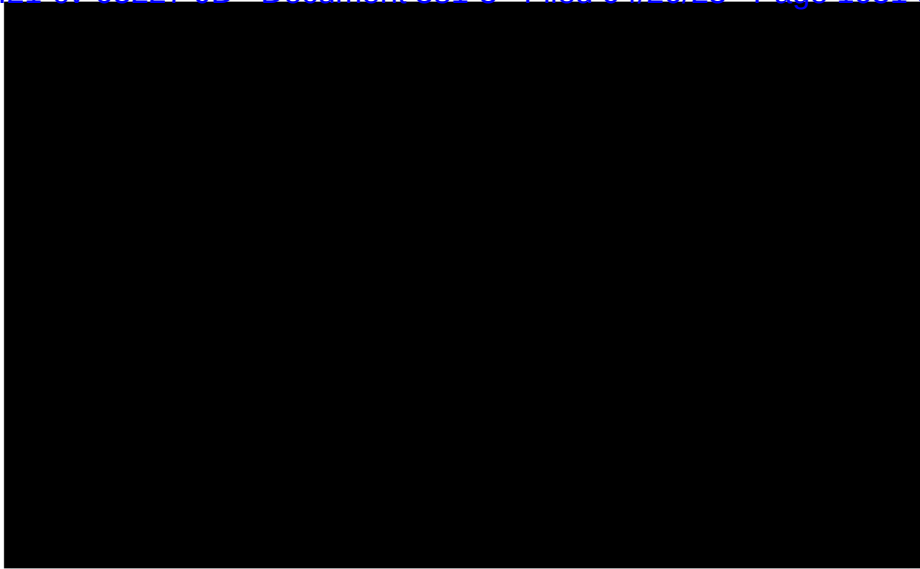Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 77.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 79.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 81.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 89.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 90.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 92.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
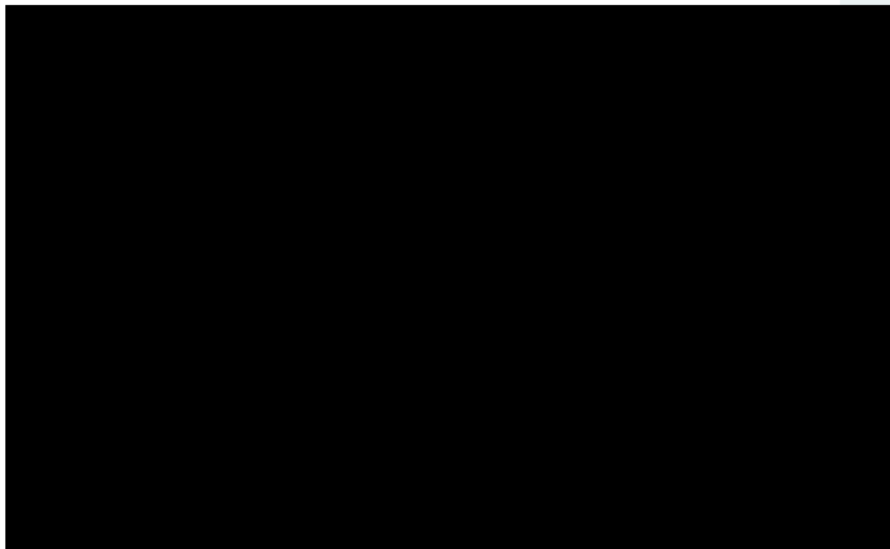[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 96.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 99.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 100.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 53.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
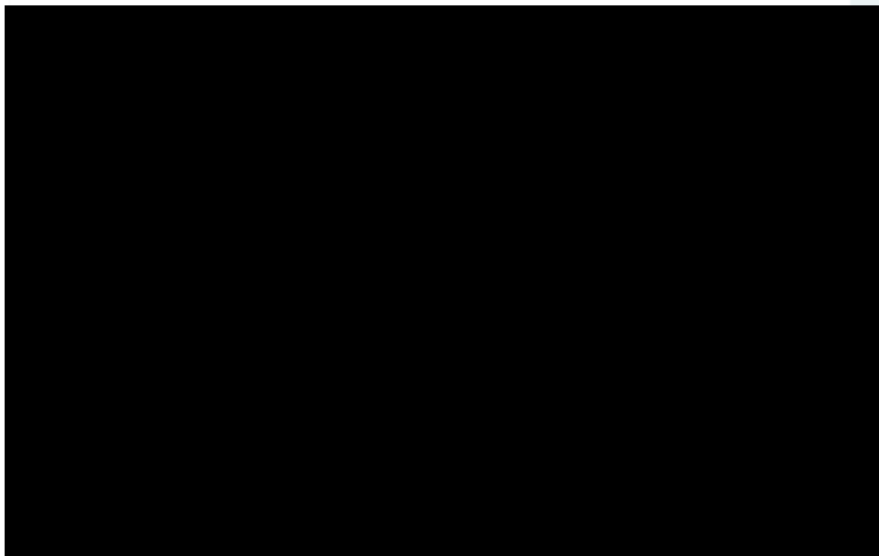[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 57.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 65.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 84.
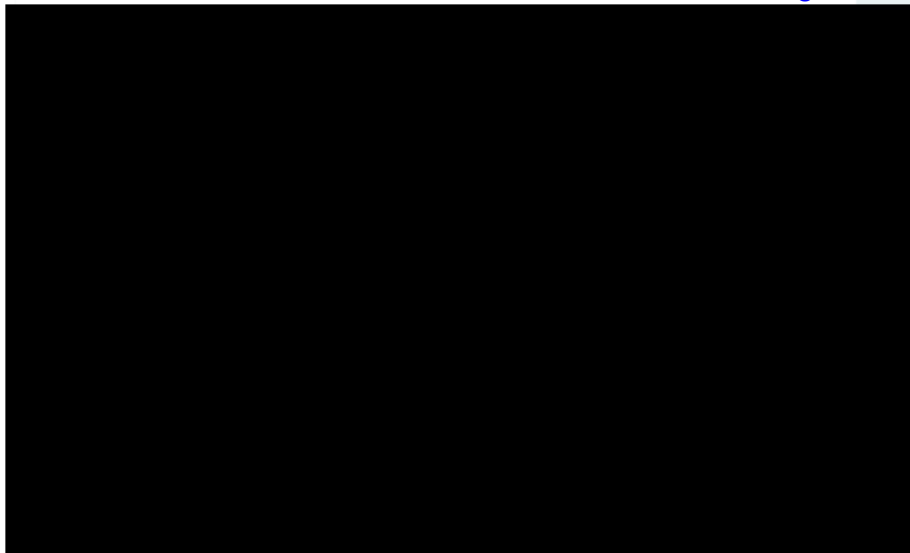[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 85.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 86.
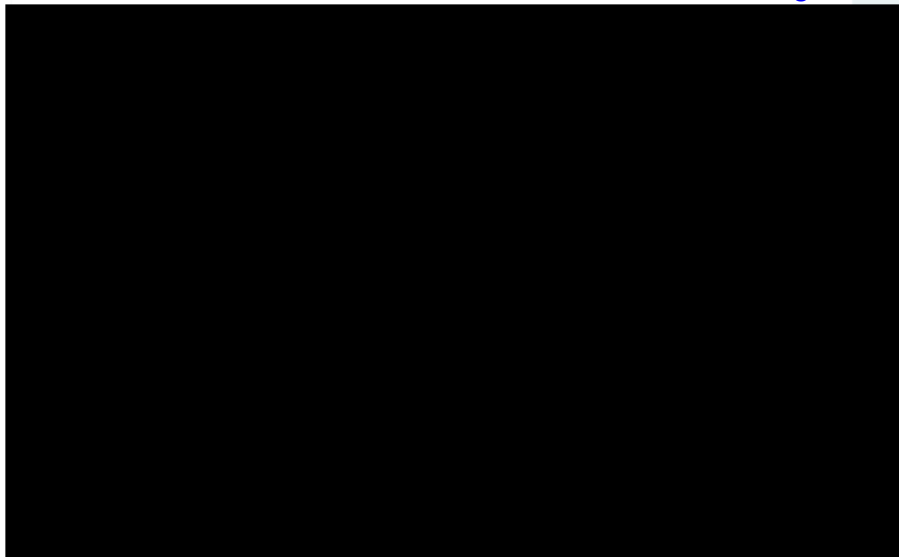[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on consumer spend during 2020.07 - 2022.05) = 93.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Exhibit 37b

Average Monthly Product Price and Service Fee Rate for Tinder Subscriptions
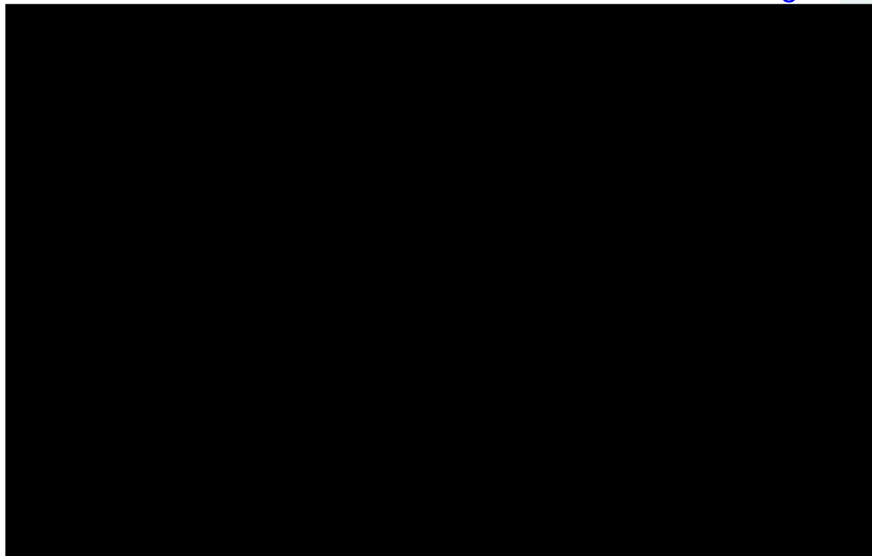
Based on Originating Orders

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 3.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 4.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 6.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 7.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 8.
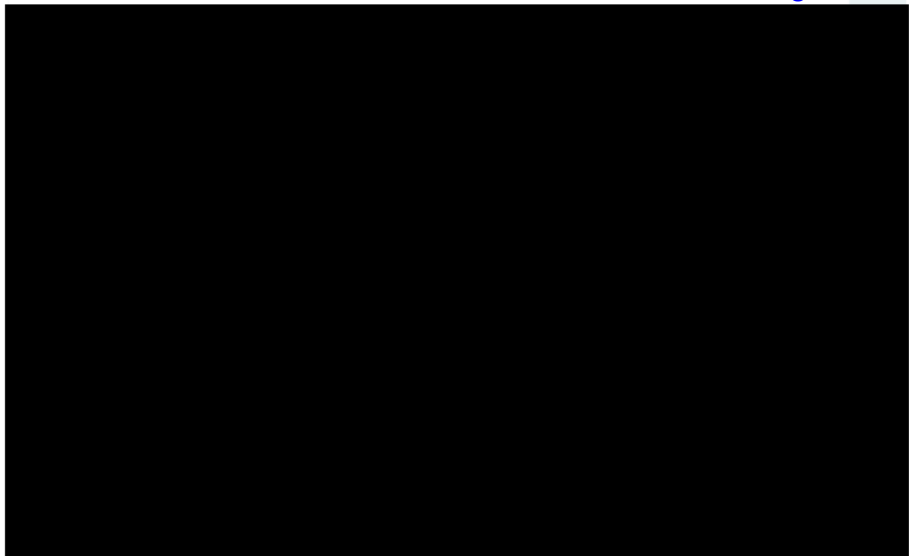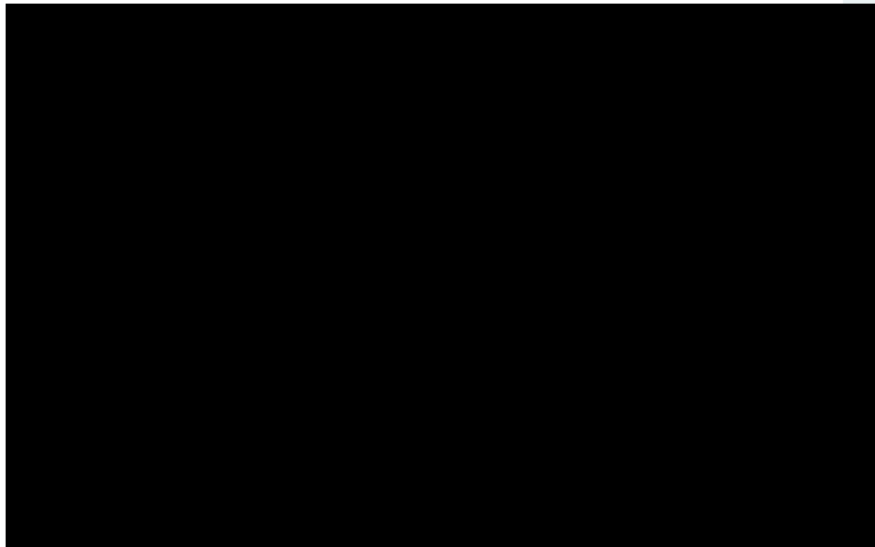[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 9.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 13.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 16.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 17.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
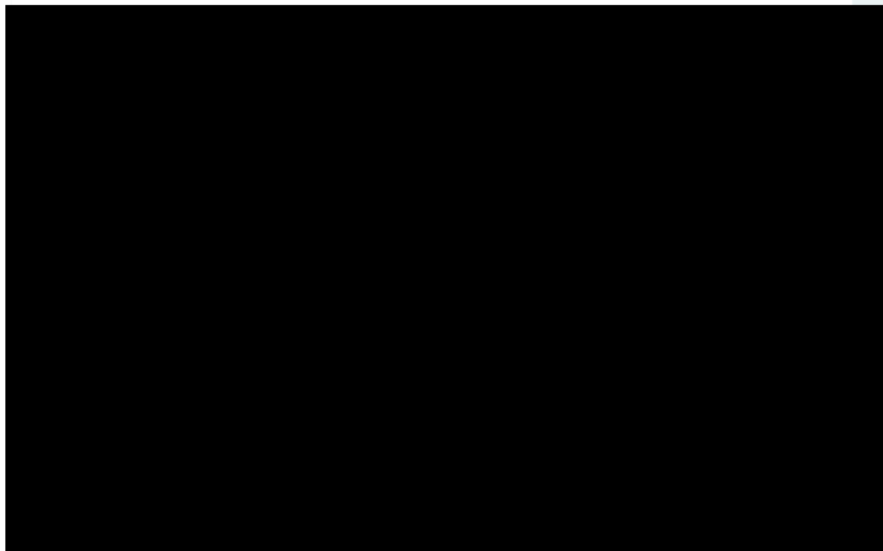[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 19.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 20.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
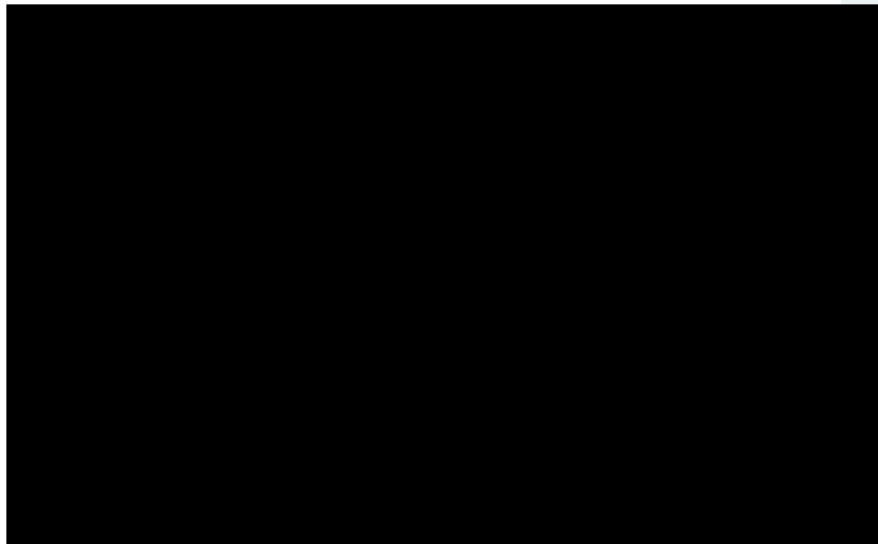[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 24.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 28.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

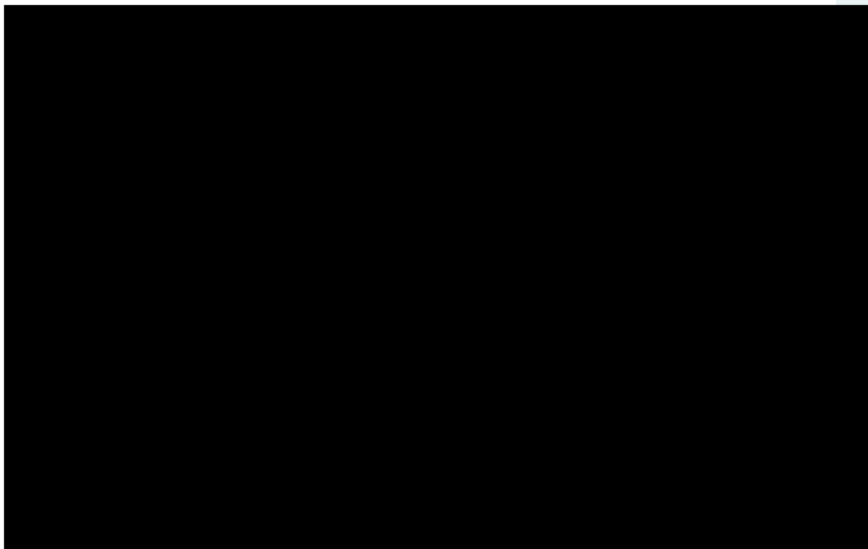Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 32.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 34.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
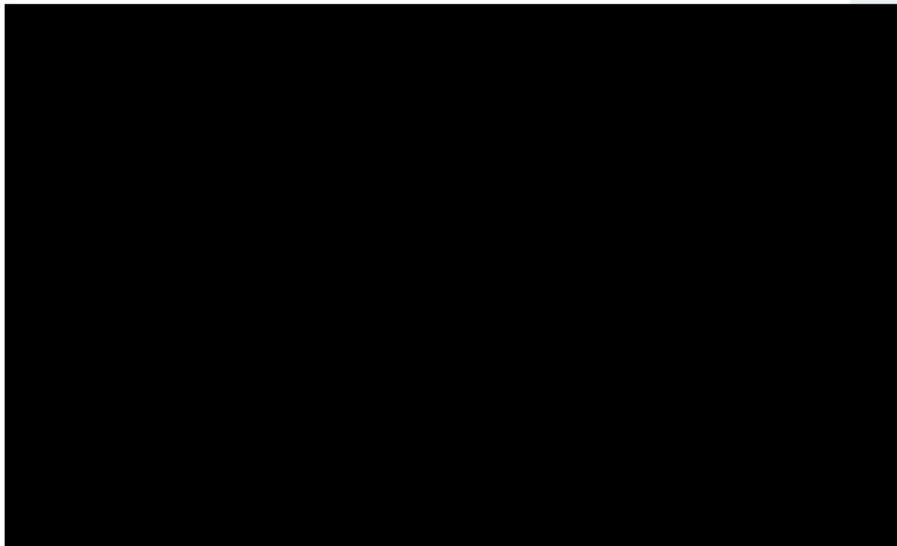
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 35.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 36.
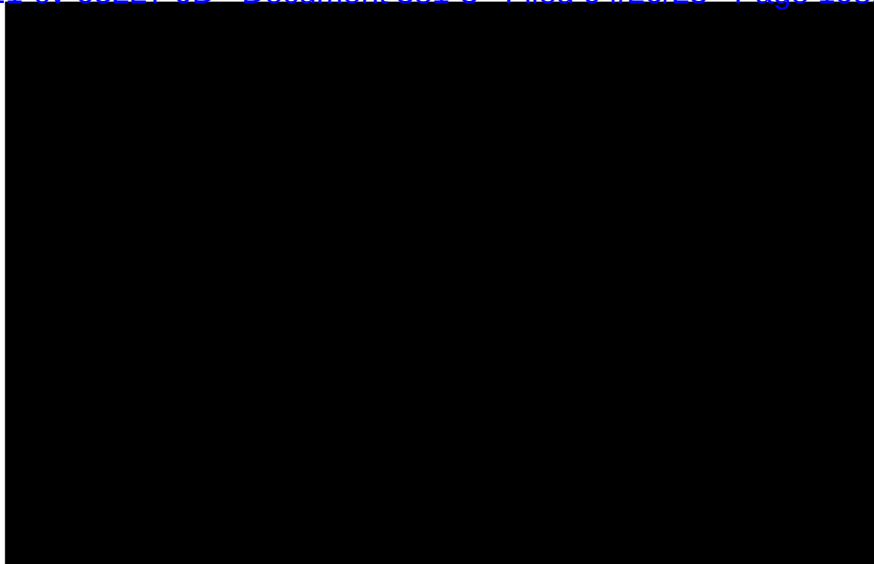[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 37.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 39.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
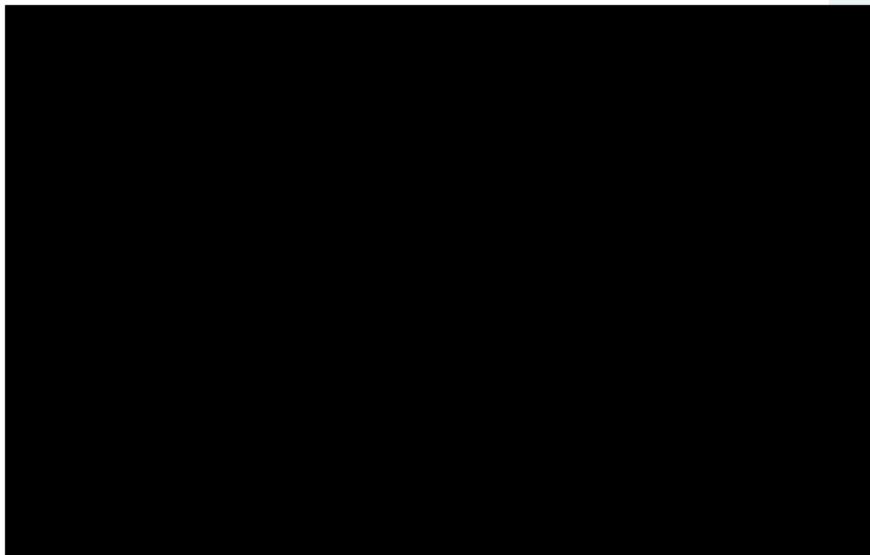
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 40.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

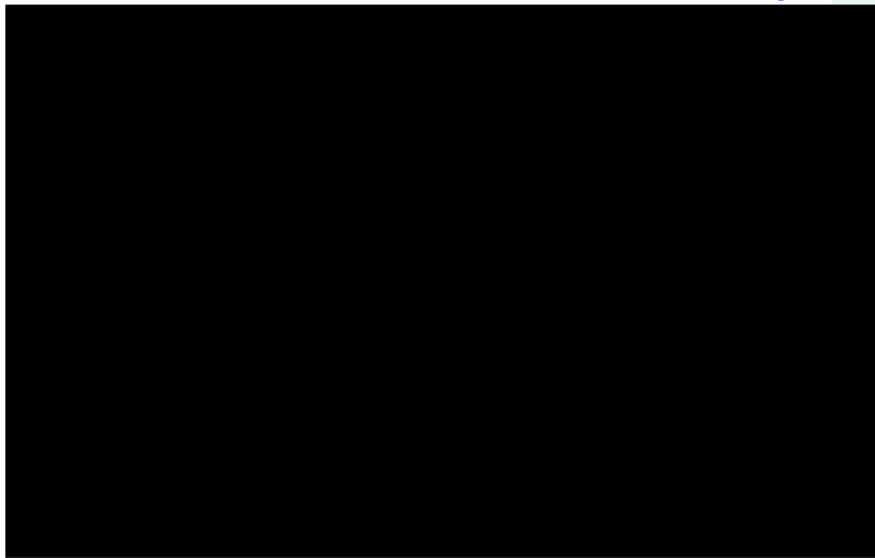Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 43.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

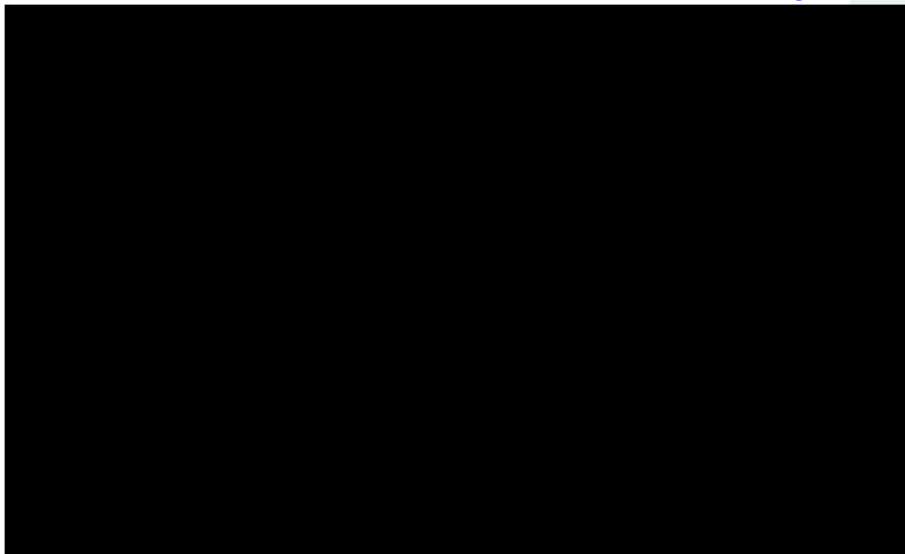Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 44.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 46.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
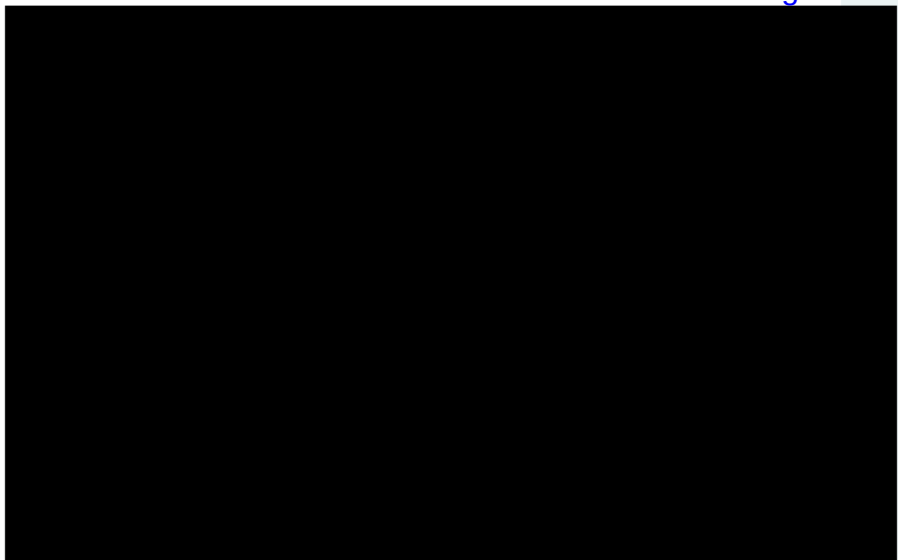
Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 48.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

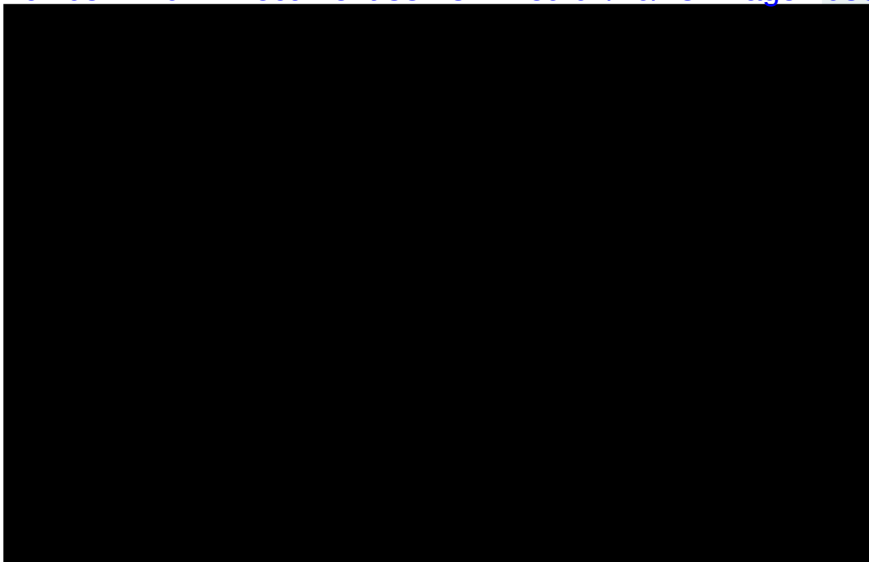Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 53.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 56.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
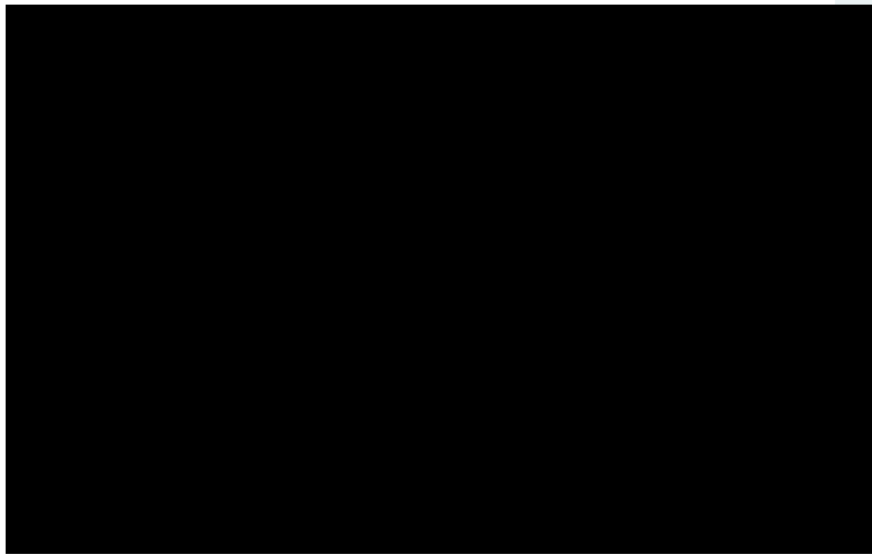
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 57.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 58.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 68.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
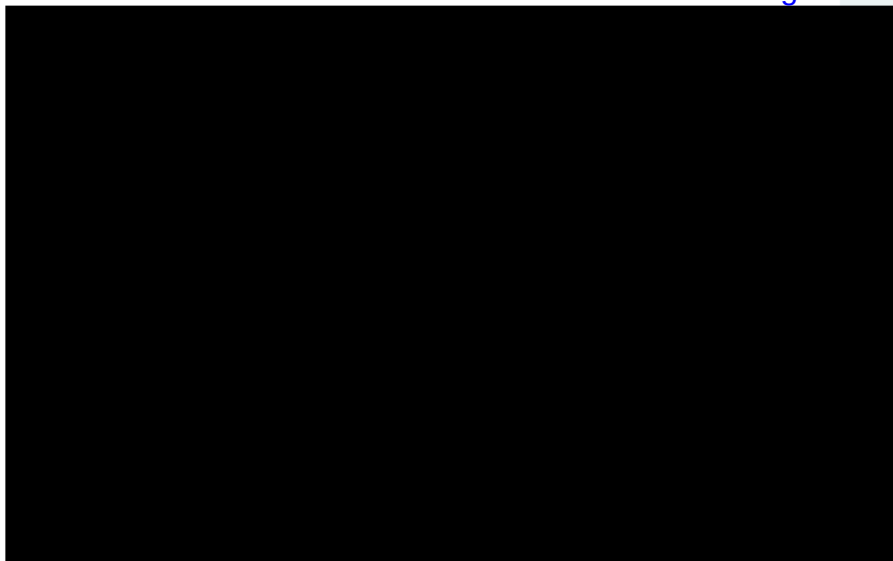[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 69.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.
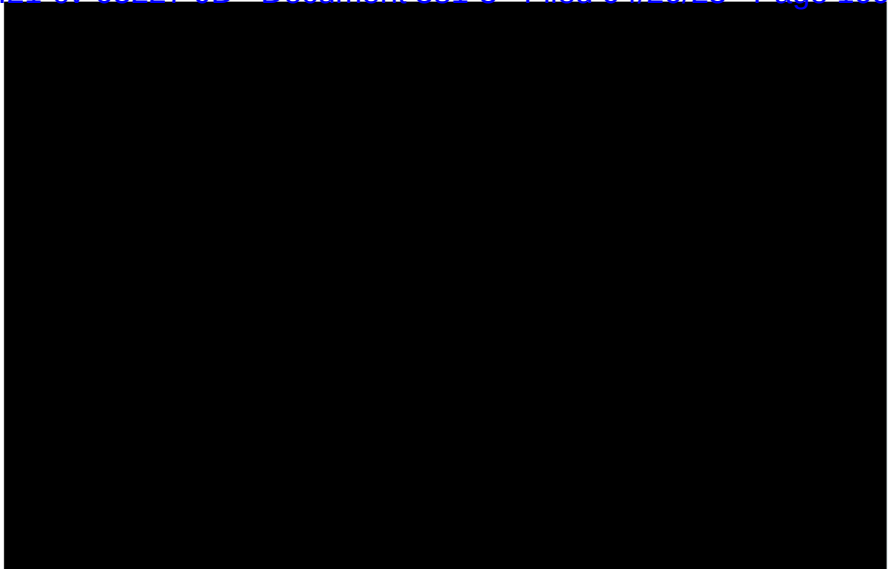
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 70.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

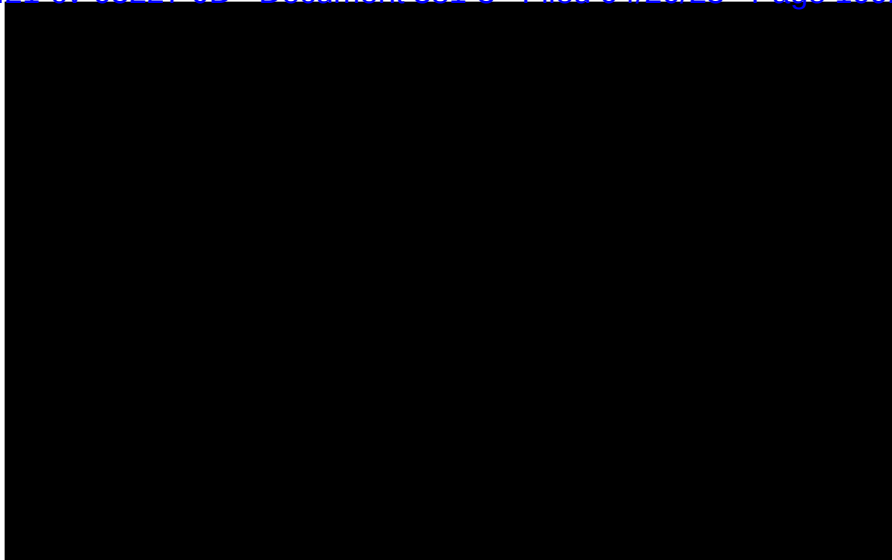Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 77.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 82.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 84.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 87.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 90.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
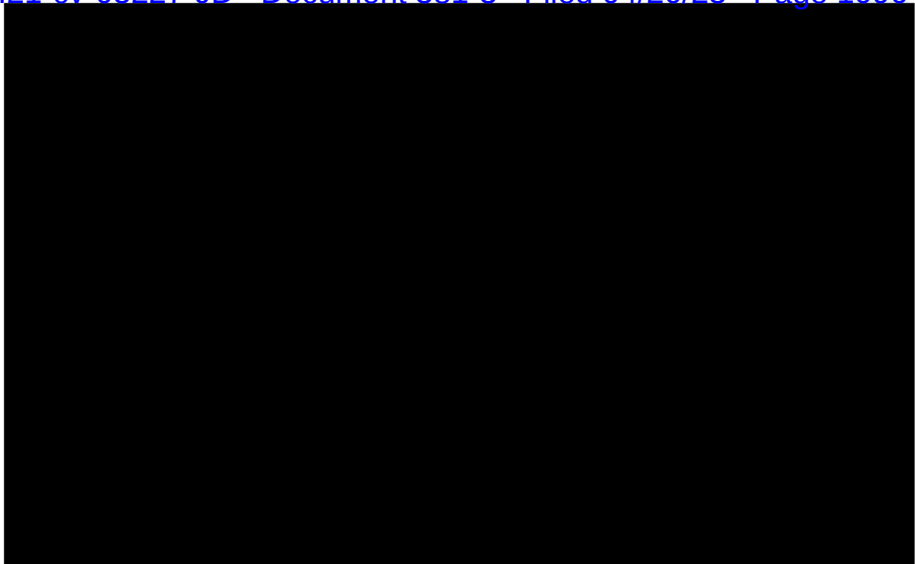[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 91.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

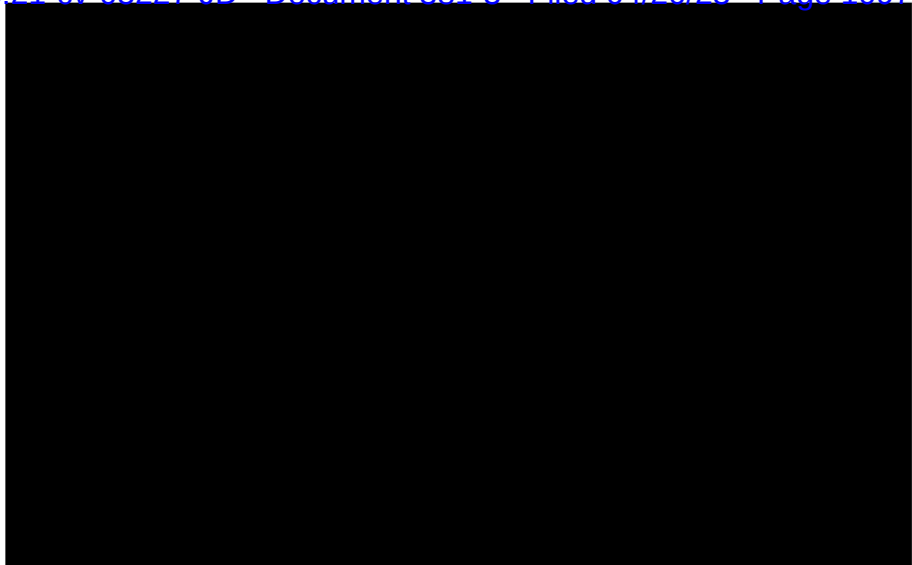Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 98.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 99.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: no change in list price, no change in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 1.
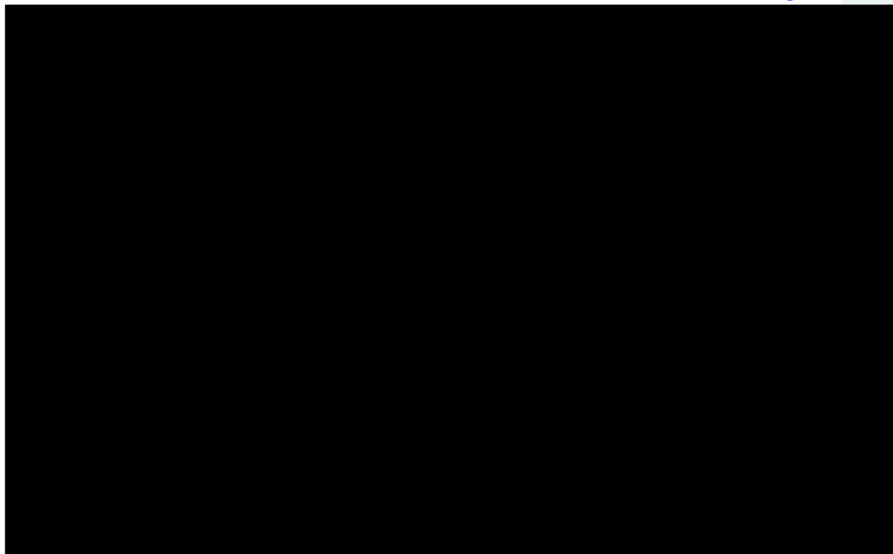[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 2.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

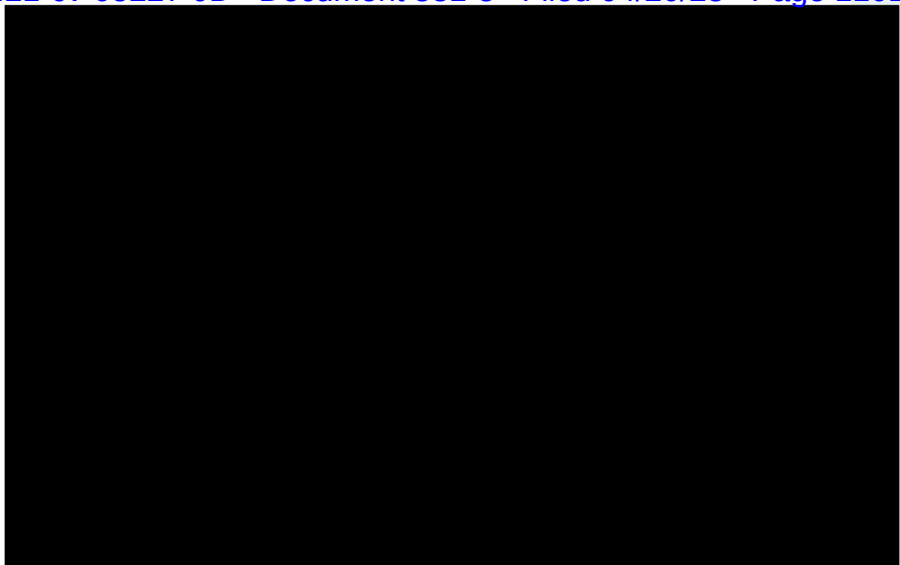Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 10.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 11.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
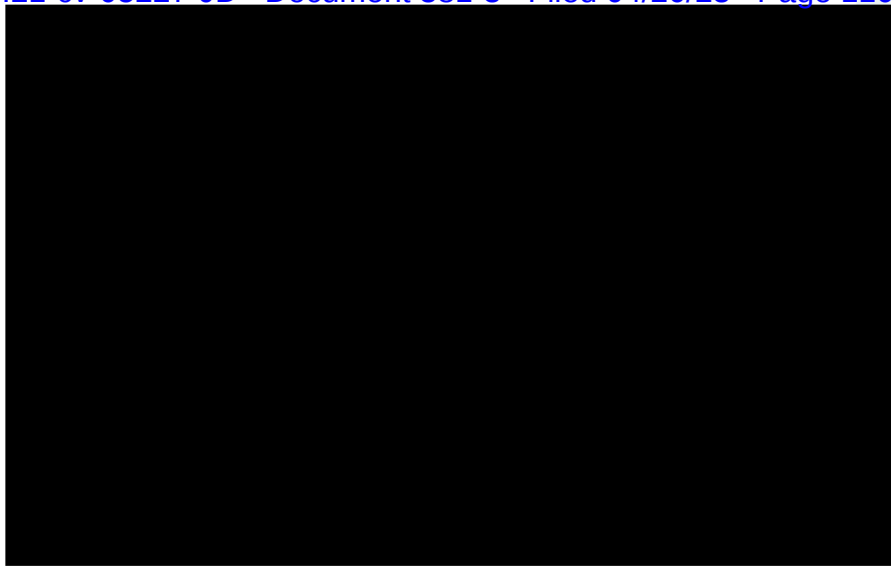
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 14.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

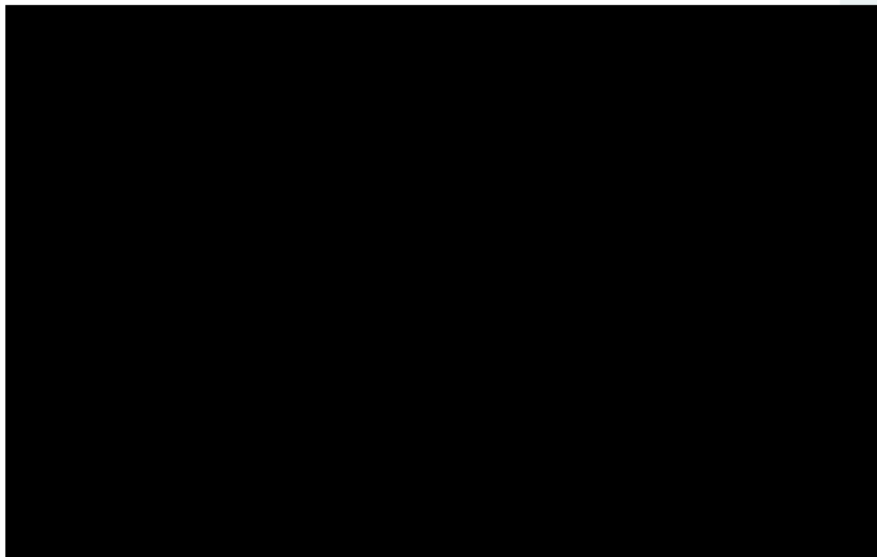Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 18.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 21.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 22.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 23.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
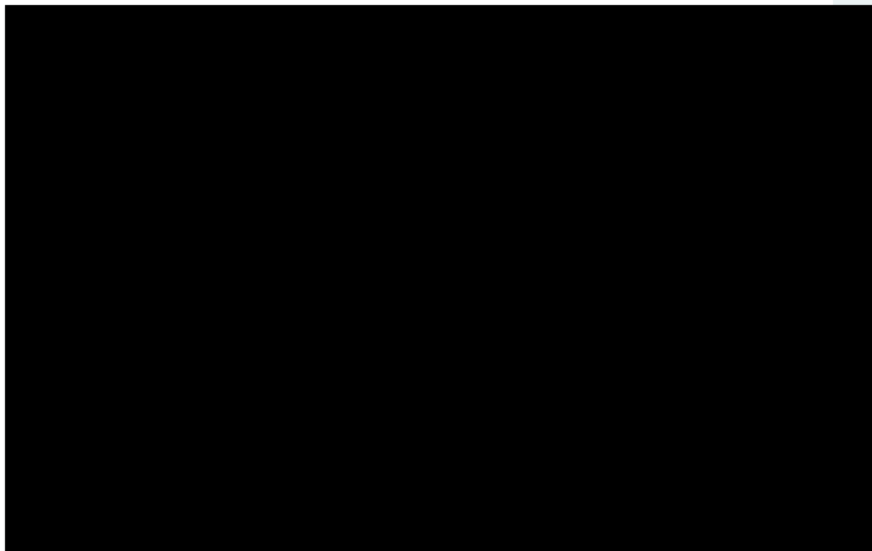[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

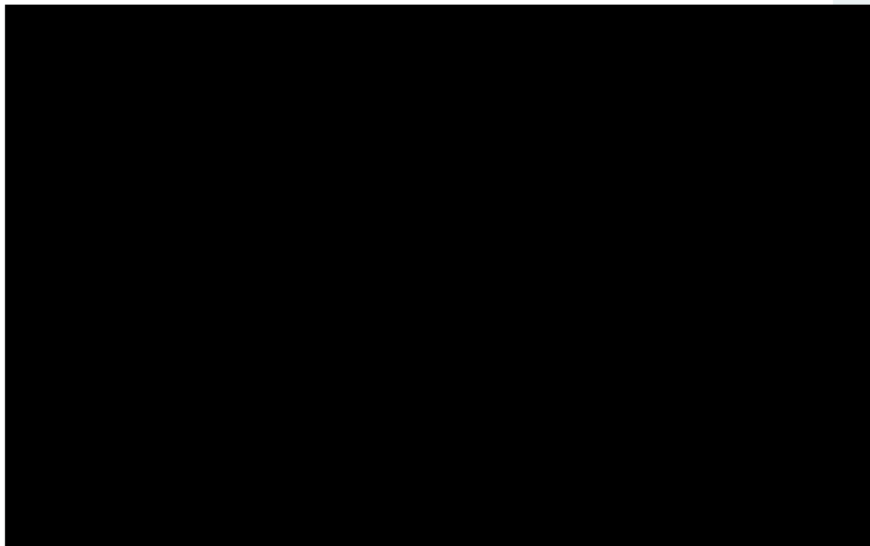Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 25.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 33.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

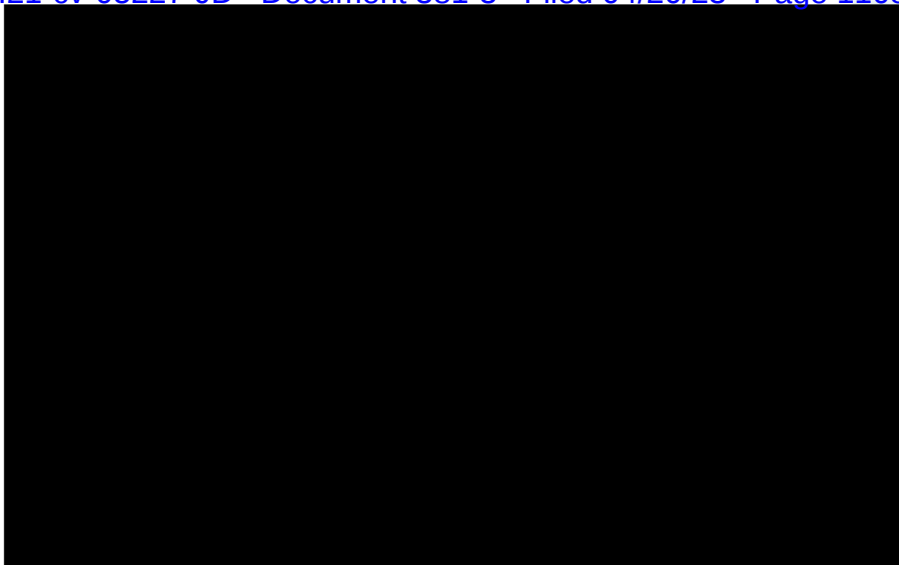Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 38.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

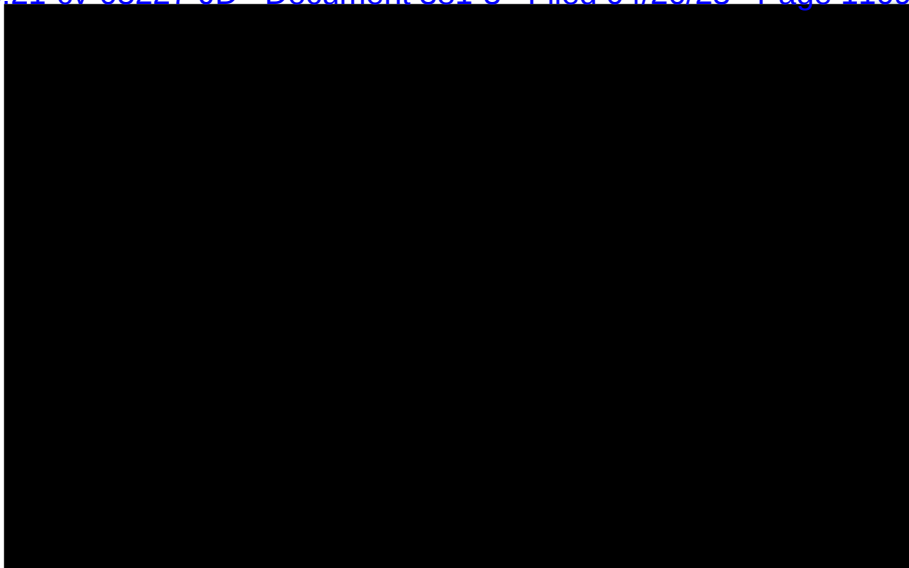Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 41.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 47.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
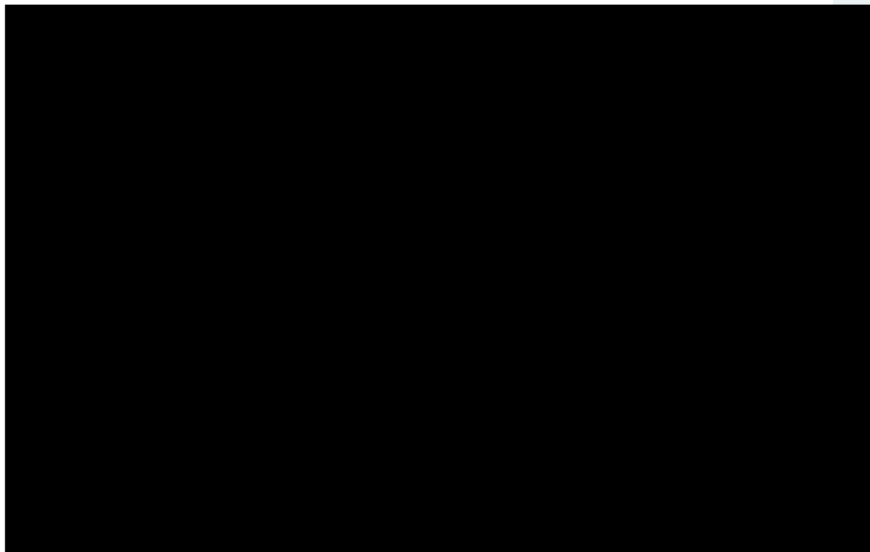
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 49.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

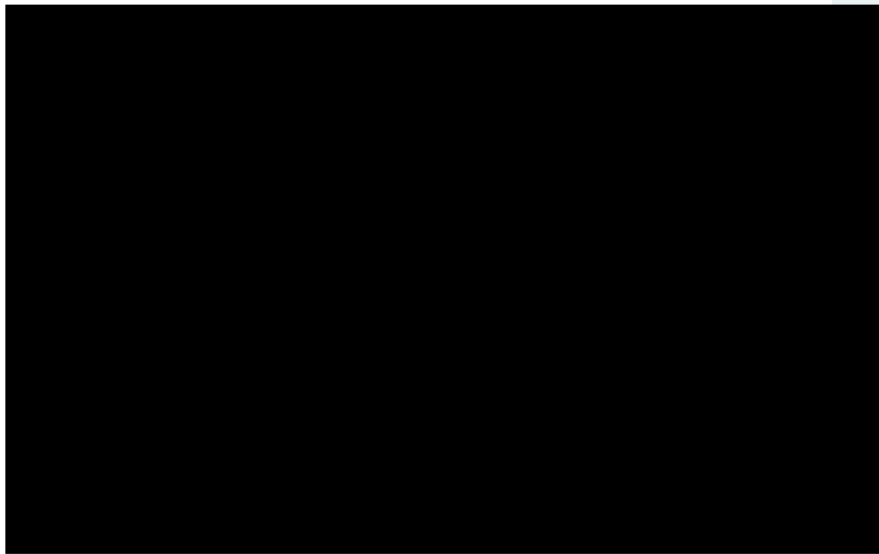Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 50.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 52.
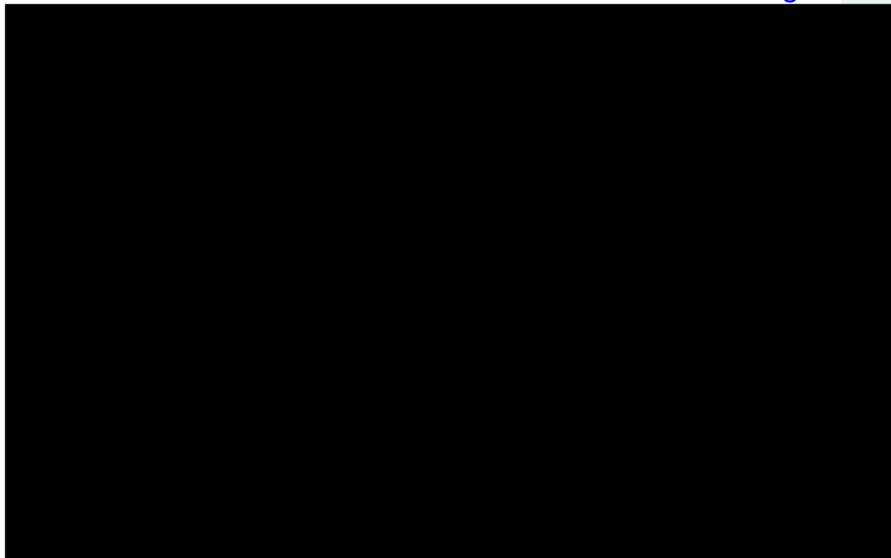[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 54.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 55.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
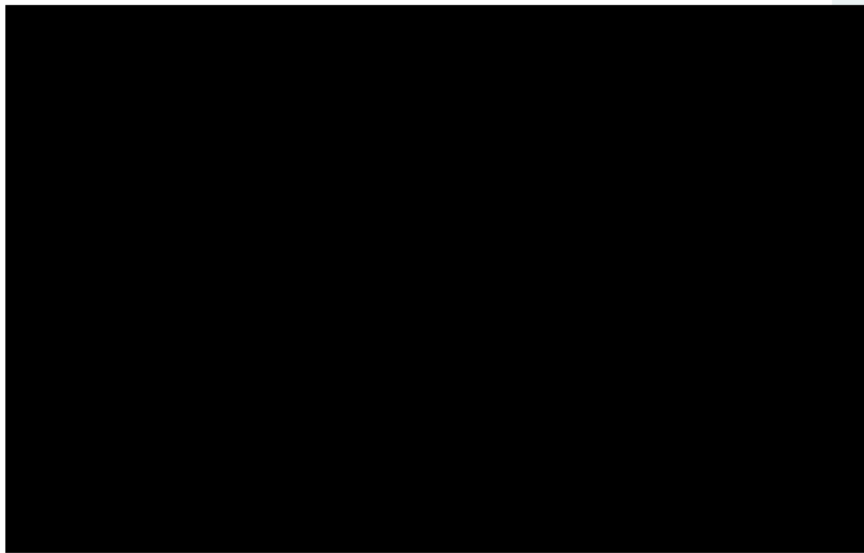
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 59.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

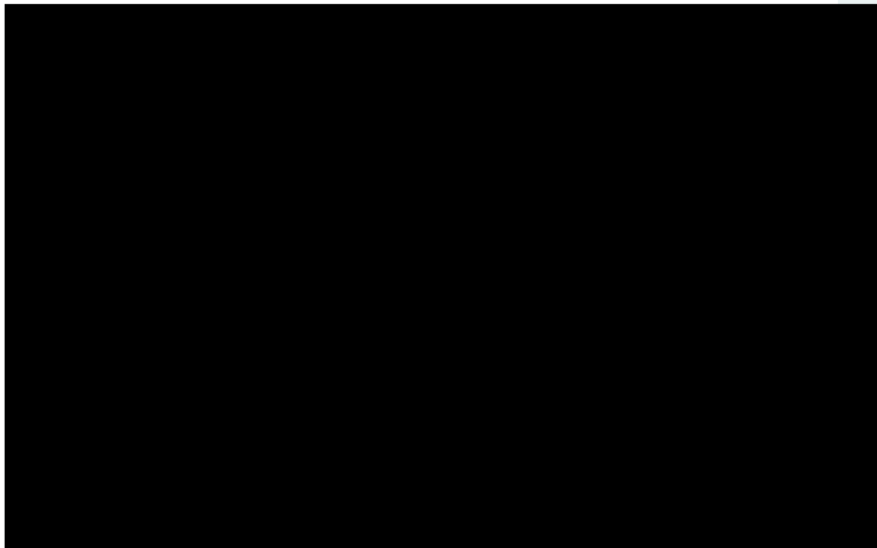Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 60.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 61.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
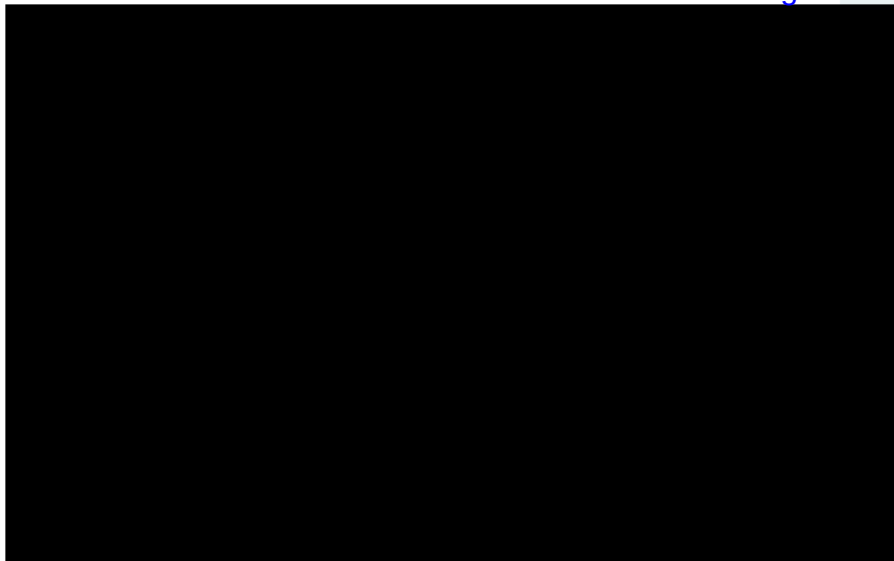
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 63.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 67.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 71.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
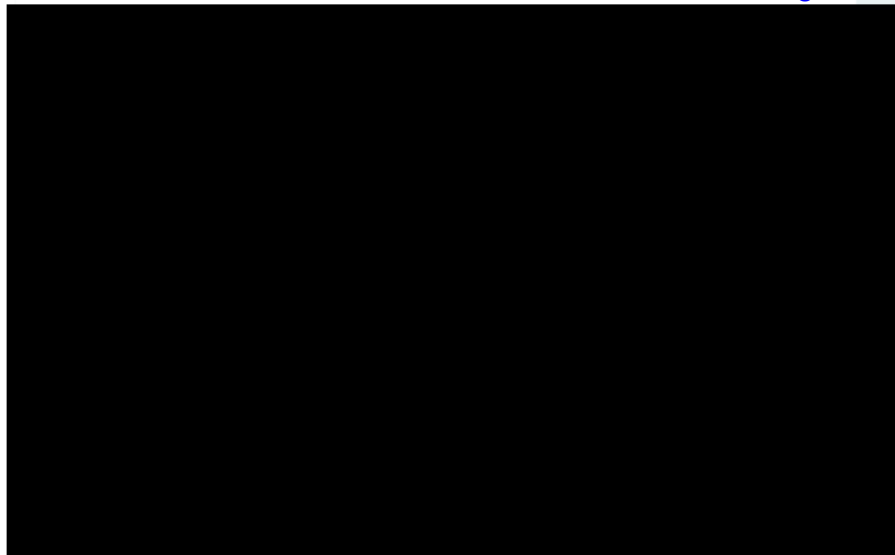[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 73.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.
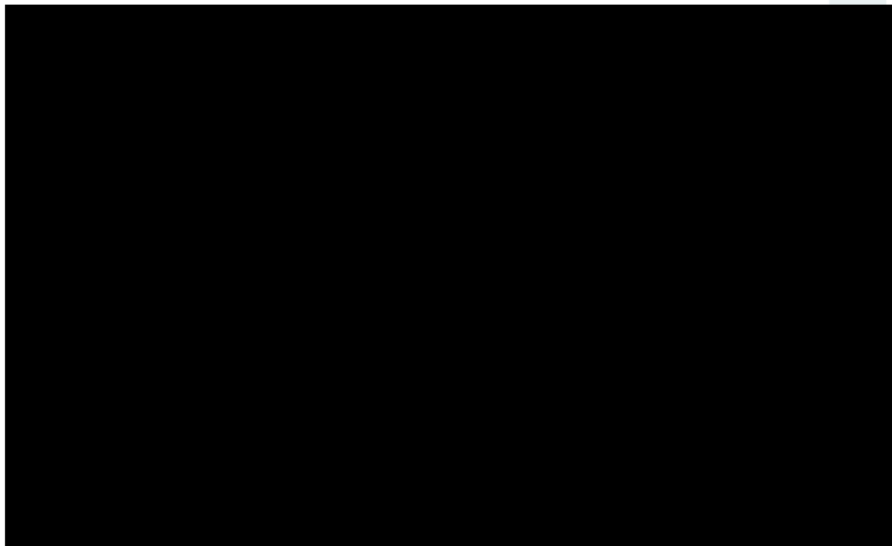
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 78.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

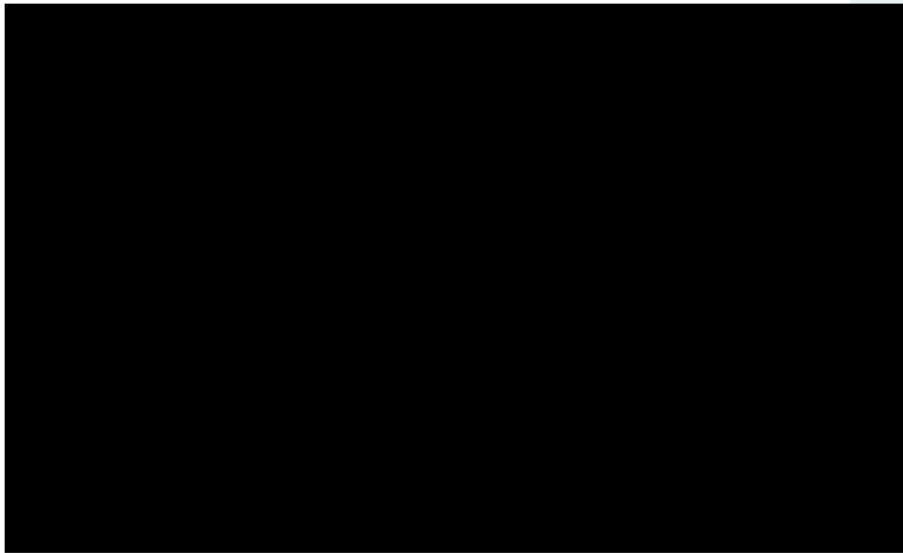Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 83.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 85.
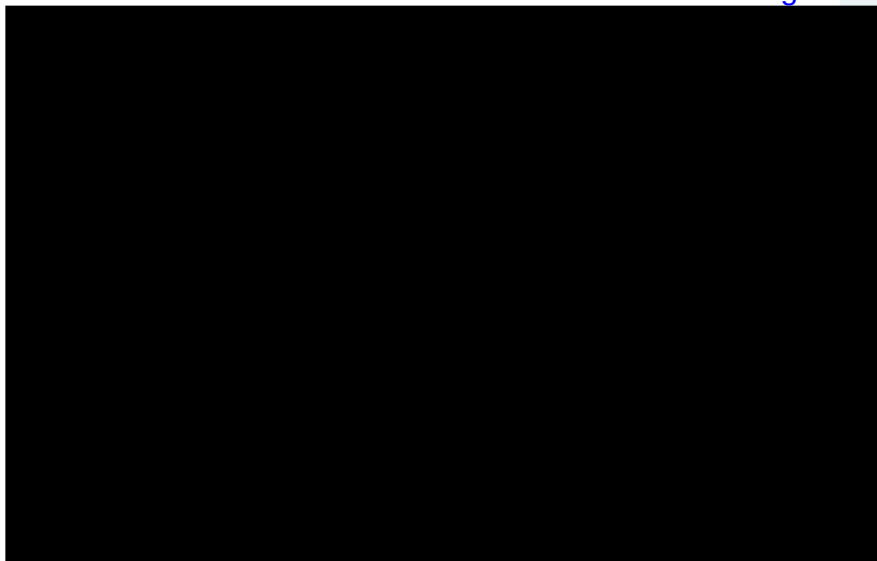[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 86.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 88.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 89.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 92.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
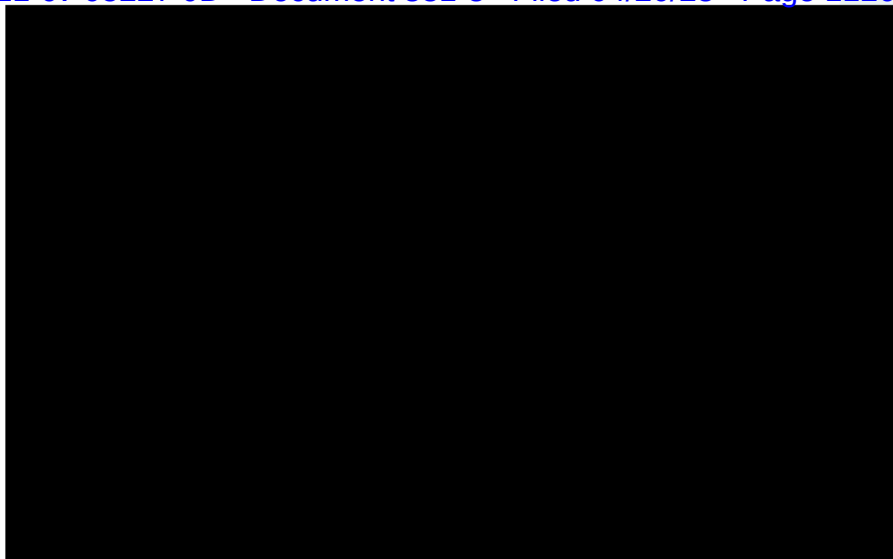[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 93.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 96.
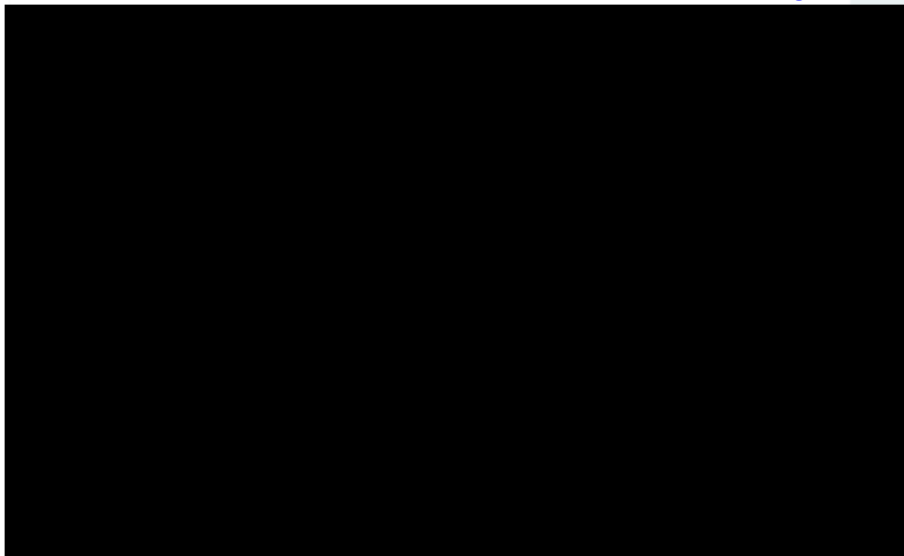[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 97.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 100.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: increase in list price, increase in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 5.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 12.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 15.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
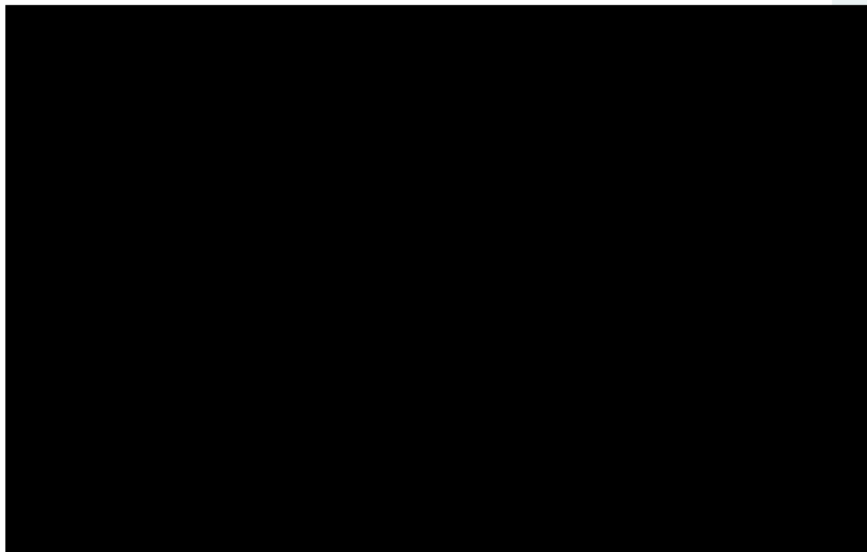[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 26.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

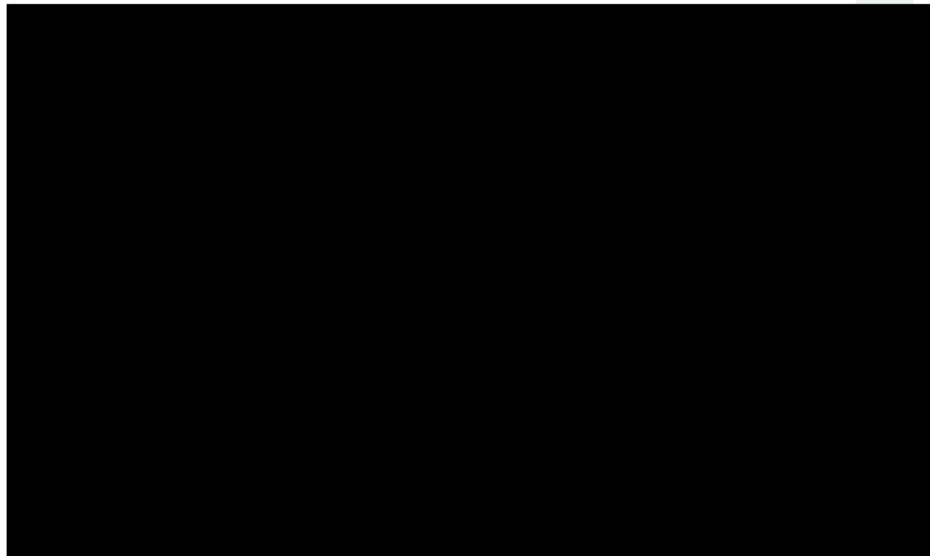Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 27.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.
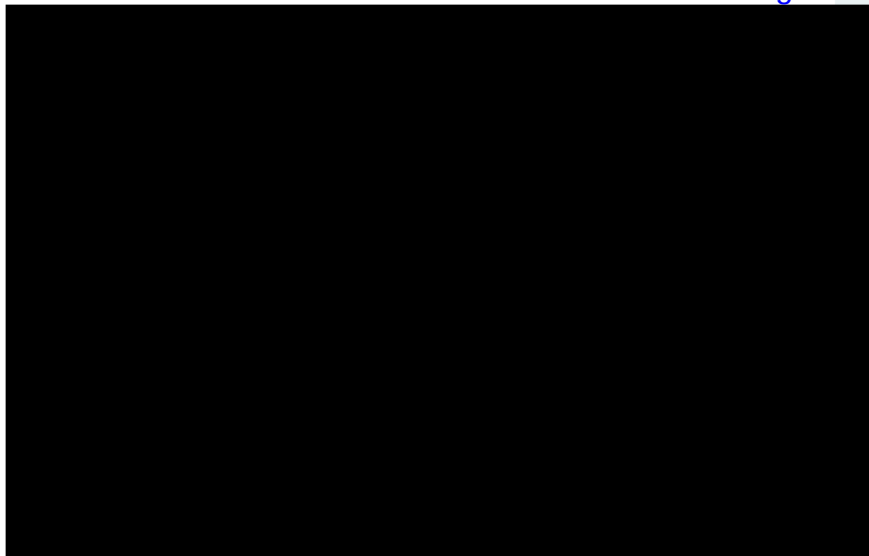
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 29.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

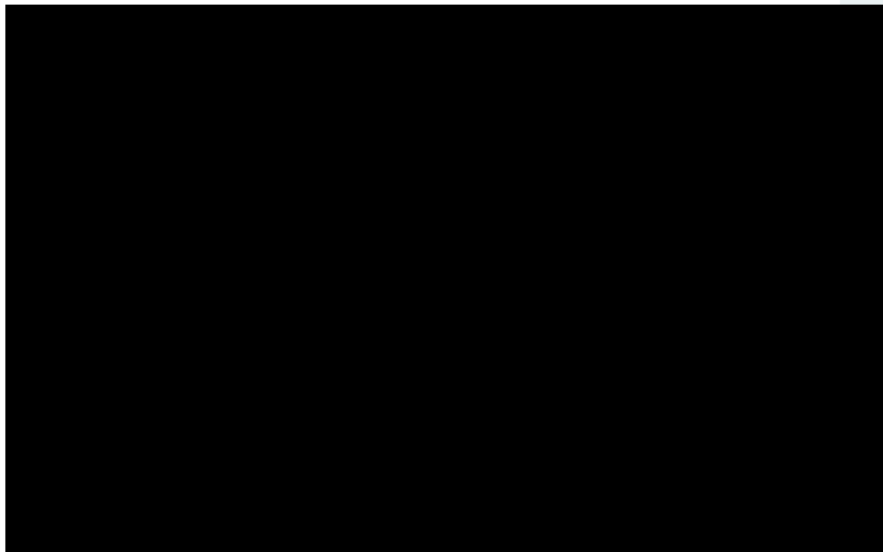Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 30.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 31.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.
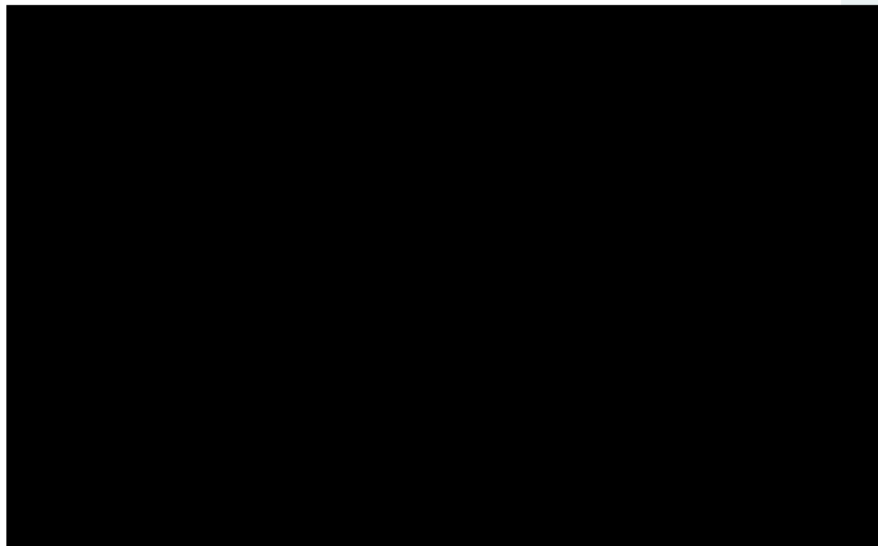
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 42.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 45.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 51.
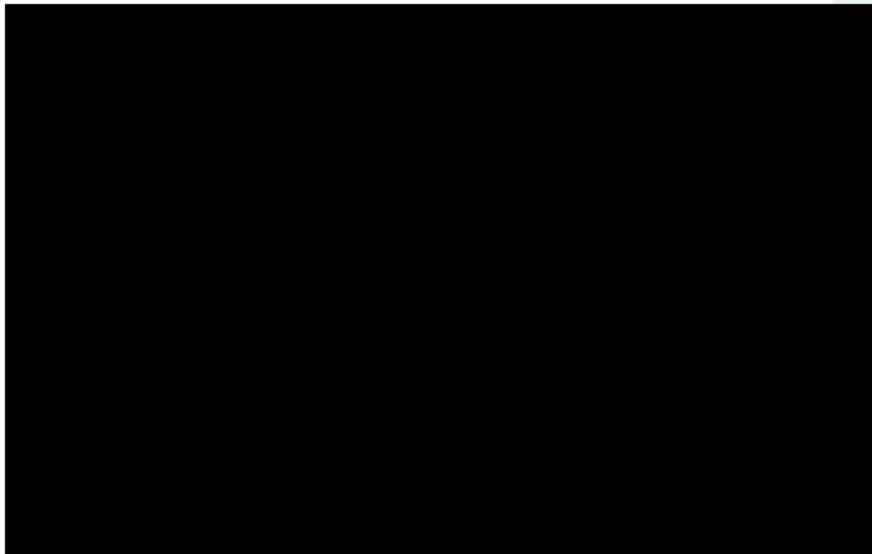[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 62.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 64.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 65.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: no change in list price, no change in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 66.
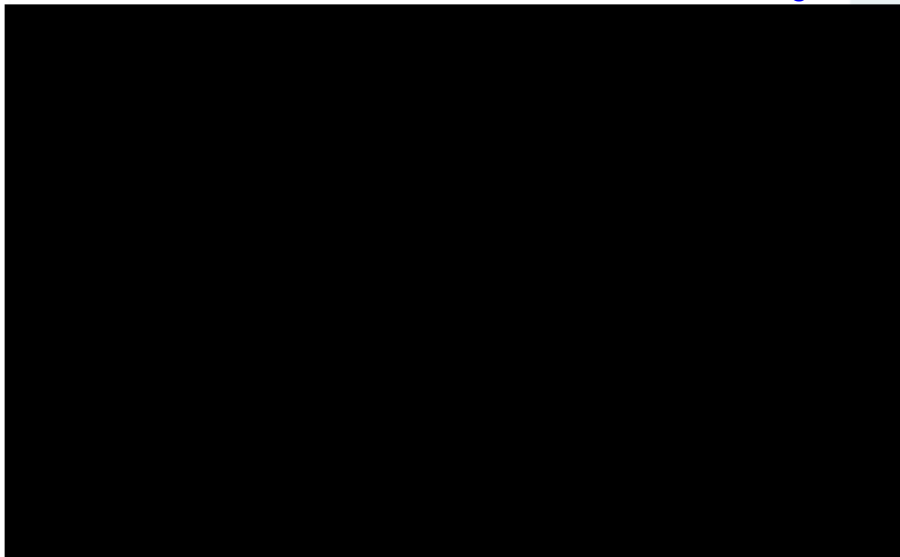[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 72.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 74.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.
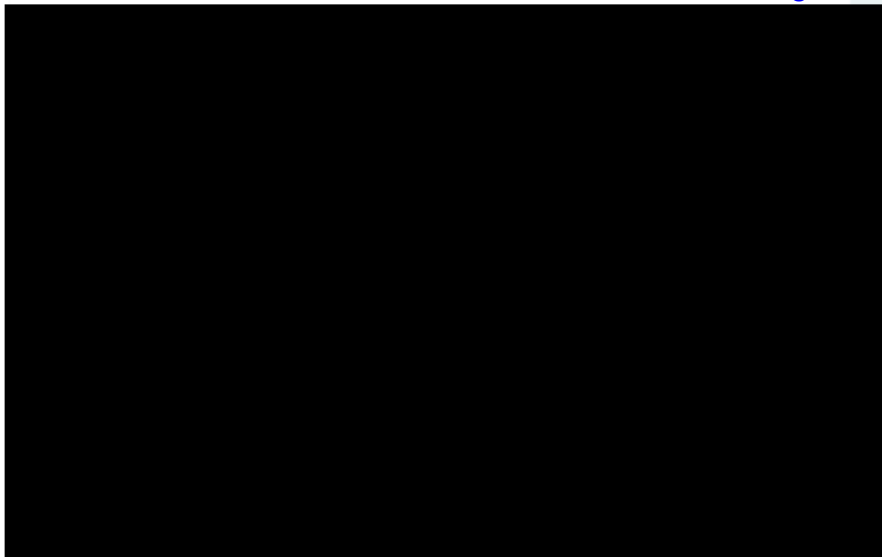
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 75.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.
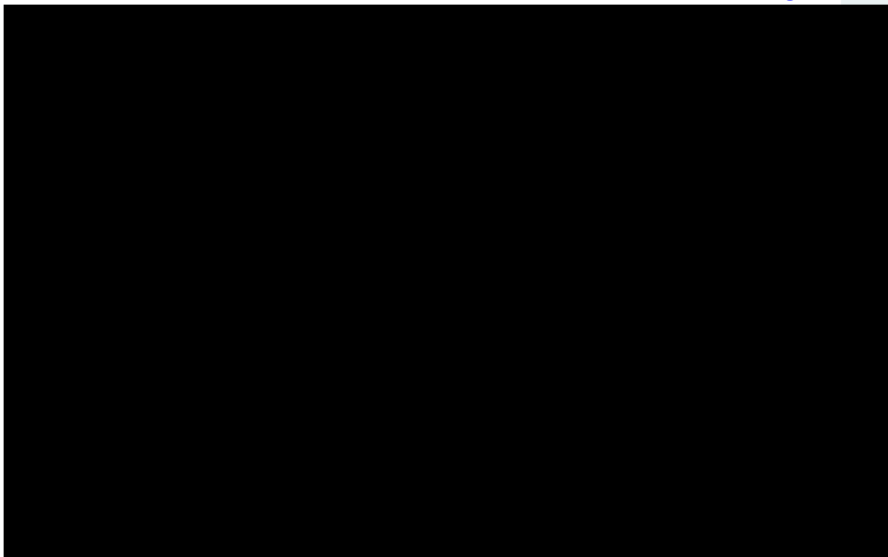
Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 76.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 79.
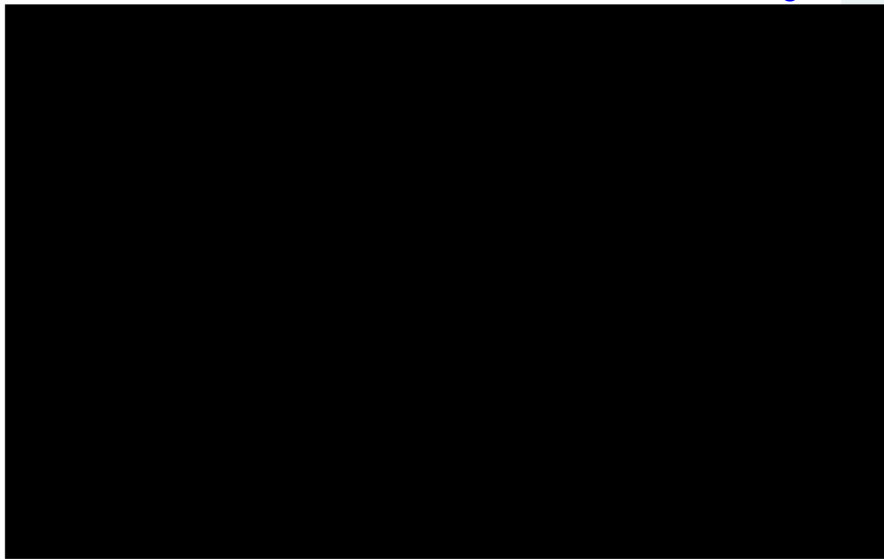[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: increase in list price, increase in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 80.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

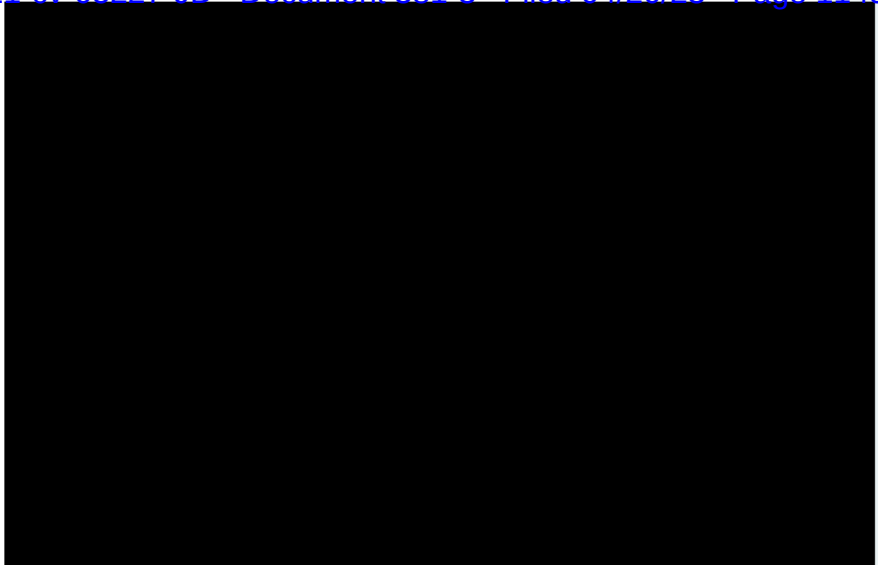Expert Report of Dr. Gregory K. Leonard

Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 81.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 94.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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Notes:
[1] Rank (based on originating consumer spend during 2020.07 - 2022.05) = 95.
[2] Price change between 2020.07 - 2021.06 and 2021.07 - 2021.12: decrease in list price, decrease in net price.
[3] Price change between 2021.07 - 2021.12 and 2022.01 - 2022.05: decrease in list price, decrease in net price.

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